

AD-A072 907

WOODWARD-CLYDE CONSULTANTS PLYMOUTH MEETING PA
NATIONAL DAM INSPECTION PROGRAM. PINE RUN DAM (SCS PA-616) (NDS--ETC(U)
JUN 79

F/G 13/2

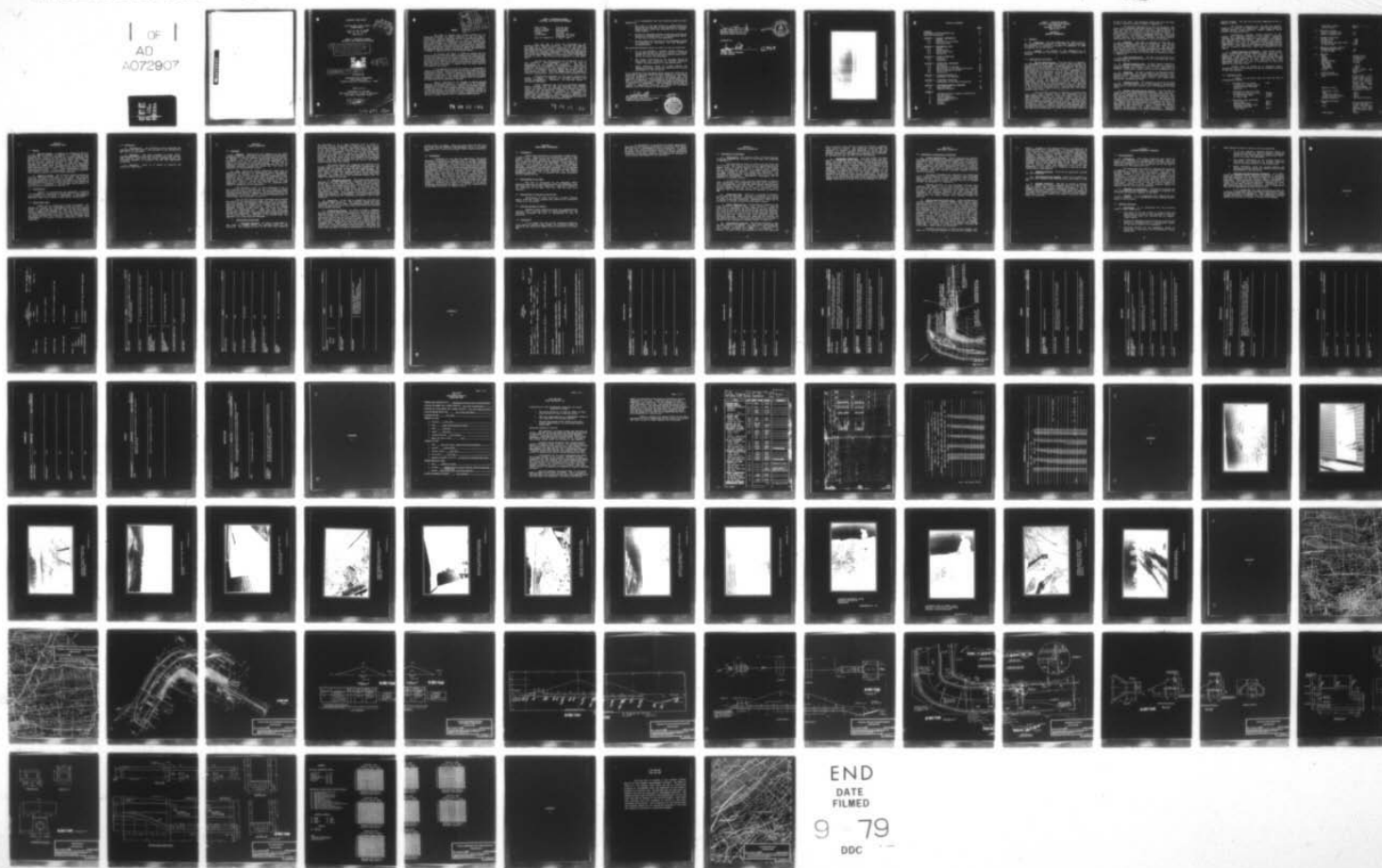
DACW31-79-C-0017

NL

UNCLASSIFIED

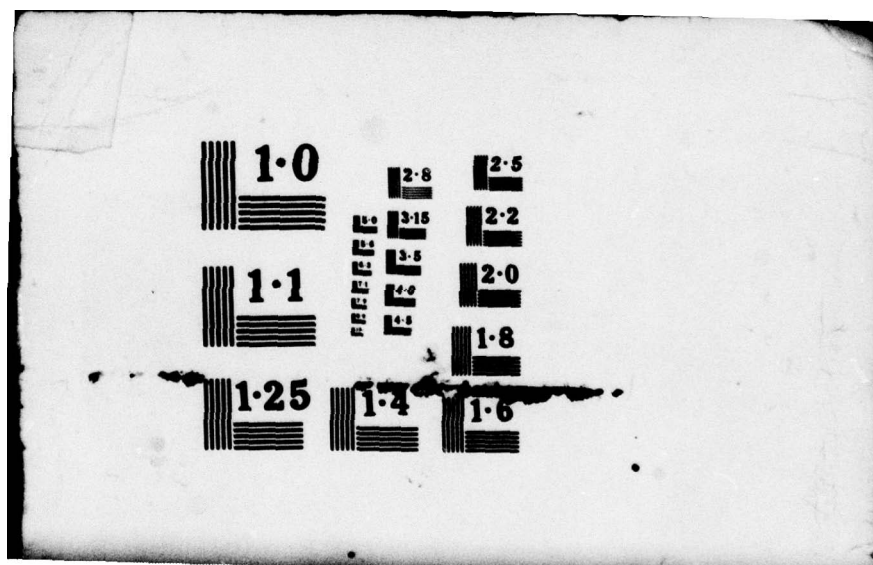
1 OF 1
AD
A072907

13



END
DATE
FILMED

9 79
DDC

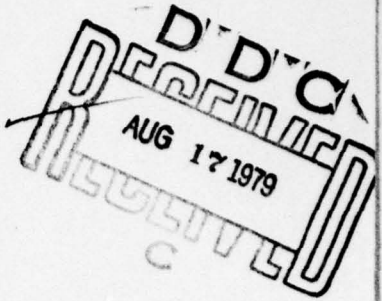


206207

DELAWARE RIVER BASIN

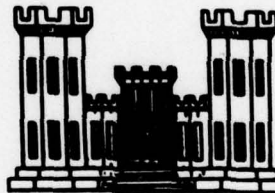
PINE RUN DAM, BUCKS COUNTY
PENNSYLVANIA

NDS I.D. NO. PA 00808
DER I.D. NO. 9-170
SCS PA 616



PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

6 National Dam Inspection Program. Pine Run Dam (SCS PA-616) (NDS ID PA ~~00808~~ DER ID 9-170), Delaware River Basin, Pine Run Creek, Bucks County, Pennsylvania, Phase I Inspection Report.



12 91 p.

15 DACW31-79-C-0017

Prepared by:

WOODWARD-CLYDE CONSULTANTS
5120 Butler Pike
Plymouth Meeting, Pennsylvania 19462

Submitted to:

DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

11 JUN 79

This document has been approved
for public release and sale; its
distribution is unlimited.

394 157 GW

PREFACE

Accession For	NTIS Grant	DDC TAB	Unannounced	Justification	By	Distribution/	Availability Codes	Avail and/or	Special	Dist

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams for Phase I Investigations. Copies of these guidelines may be obtained from the Office of the Chief of Engineers, Washington, D. C., 20314. The purpose of a Phase I investigation is to expeditiously identify those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify the need for more detailed studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected, and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

79 08 15 095

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

Name of Dam:	Pine Run Dam
County Located:	Bucks County
State Located:	Pennsylvania
Stream:	Pine Run
Coordinates:	Latitude 40° 18.5'
	Longitude 75° 10.9'
Date of Inspection:	23 April 1979

Pine Run Dam is owned and maintained by the Neshaminy Water Resources Authority. The dam and reservoir are used as a flood control structure for the Pine Run Watershed upstream of Chalfont, Pennsylvania. This dam is one of a series of 10 either constructed or proposed flood control dams within the Neshaminy Watershed. The dam was designed by the United States Department of Agriculture, Soil Conservation Service, in 1971. The structure was completed in late summer 1974.

The dam and appurtenances are considered to be in fair condition. This assessment is due to the lack of maintenance of the slopes and embankment. The dam is classified as an "Intermediate" size dam with a "High" hazard potential consistent with the possibility, in the event of failure, for extensive property damage and probable loss of life along the creek. The main damage center is located at Chalfont, Pennsylvania, where Pine Run enters Neshaminy Creek.

Calculations presented in this report indicate the system is capable of passing the Probable Maximum Flood without overtopping. Therefore, the spillway system is considered "Adequate".

Visual inspection and review of available documentation indicate that the dam was designed with adequate factors of safety for the embankment and appurtenant structures, and the documentation reviewed for this inspection indicates that all work was performed in accordance with specification requirements. However, visual inspection revealed that maintenance of this structure is deficient and many items require rehabilitation. Recommendations pertaining to these deficiencies are presented below.

79 08 15 1979

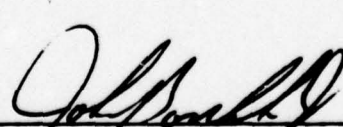
It is recommended that the following steps be taken immediately.

1. The crest of the dam should be rehabilitated and stabilized with gravel or other materials to prevent deterioration which has occurred due to unauthorized traffic.
2. Erosion on embankment slopes should be corrected and vegetation reestablished in a satisfactory manner on the entire slope of the embankment.
3. Erosion along the shoreline of the embankment should be stabilized in accordance with the designer's recommendations.

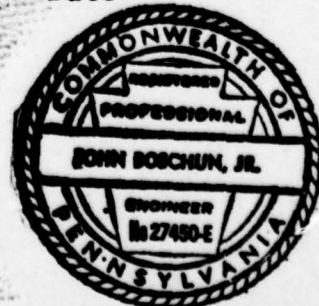
The following measures should be taken as soon as practical.

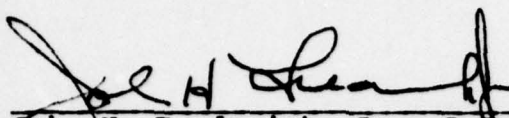
1. If at all possible, suitable devices should be constructed around the dam to prevent or minimize access of trail bikes and other unauthorized vehicles on the crest and embankment.
2. The channel downstream of the spillway should be stabilized with materials to prevent continued erosion and deterioration of the stream banks.
3. Woody vegetation along the stream channel and emergency spillway should be removed during routine maintenance of the structure.

It is understood that Neshaminy Water Resources Authority is preparing an operation and maintenance procedure in accordance with SCS guidelines. It is also understood that this procedure contains a warning system to be implemented in the event of an emergency. The procedures should be completed as soon as practical and should include the suggestions presented in Section 7.2, paragraph b. The procedures should then be issued to responsible personnel who should be thoroughly familiar with the contents of the procedure.


John Boschuk, Jr., P.E.
Pennsylvania Registration 27450E
Woodward-Clyde Consultants

6/13/79
Date

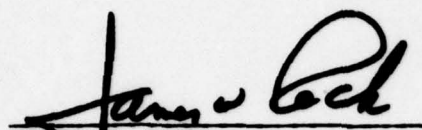



John H. Frederick, Jr., P.E.
Maryland Registration 7301
Woodward-Clyde Consultants

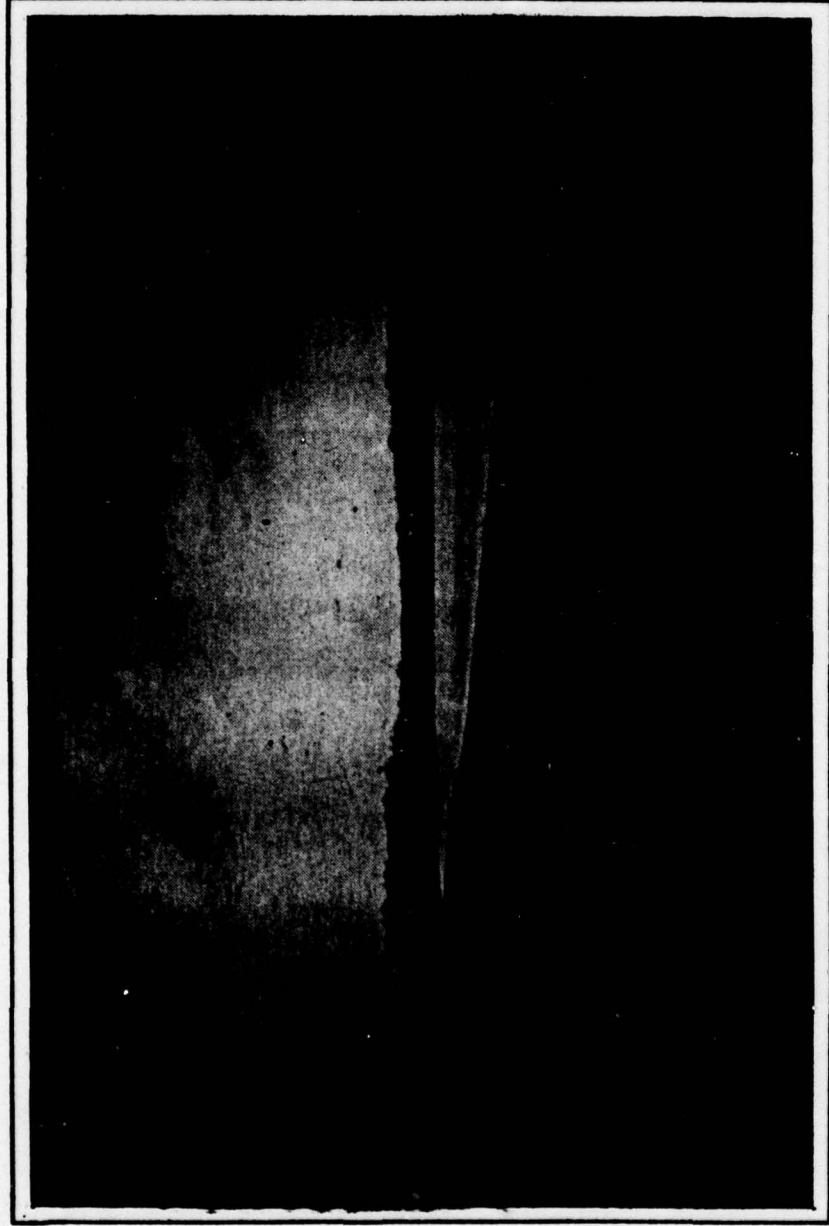
6/13/79
Date



APPROVED BY:


JAMES N. PECK
Colonel, Corps of Engineers
District Engineer

17 July 79
Date



OVERVIEW
PINE RUN DAM, BUCKS COUNTY, PENNSYLVANIA

TABLE OF CONTENTS

	<u>PAGE</u>
Preface	i
Assessment and Recommendations	ii
Overview Photograph	v
 SECTION 1 - PROJECT INFORMATION	
1.1 General	1
1.2 Description of Project	1
1.3 Pertinent Data	3
 SECTION 2 - ENGINEERING DATA	
2.1 Design	5
2.2 Construction	5
2.3 Operational Data	5
2.4 Evaluation	6
 SECTION 3 - VISUAL INSPECTION	
3.1 Findings	7
3.2 Evaluation	9
 SECTION 4 - OPERATIONAL PROCEDURES	
4.1 Procedures	10
4.2 Maintenance of the Dam	10
4.3 Maintenance of Operating Facilities	10
4.4 Warning Systems In Effect	10
4.5 Evaluation	10
 SECTION 5 - HYDROLOGY/HYDRAULICS	
5.1 Evaluation of Features	12
 SECTION 6 - STRUCTURAL STABILITY	
6.1 Evaluation of Structural Stability	14
 SECTION 7 - ASSESSMENT/REMEDIAL MEASURES	
7.1 Dam Assessment	16
7.2 Remedial Measures	16
 APPENDIX	
A Engineering Data, Design, Construction and Operation	
B Visual Inspection	
C Hydrology/Hydraulics	
D Photographs	
E Plates	
F Geology	

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
PINE RUN DAM
NATIONAL ID #PA 0080
DER #9-170

SECTION 1
PROJECT INFORMATION

1.1 General.

a. Authority. The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

b. Purpose. The purpose of the inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project.

a. Dam and Appurtenances. Pine Run Dam is a homogeneous embankment with an impervious cutoff trench beneath the centerline of the embankment. ~~A typical plan of the dam and profile are shown on Plates 2 and 3, Appendix E.~~ The dam is approximately 2,700 feet long and the height, measured from the stream bed to the crest, is 31.8 feet. Embankment fill was obtained from emergency spillway excavation and borrow areas within the reservoir. Zone 1 materials used in the cutoff trench are classified as low plastic silts, and Zone 2 materials are slightly less plastic but still classified as low plastic silts. The embankment internal drainage system discharges through the sidewalls of Saint Anthony's Falls (SAF) stilling basin at the downstream toe. The upstream slope is 3H:1V and the downstream slope is 2.5H:1V. The crest is 14 feet wide at elevation 287.8. The upstream slope has a 15 foot wide berm at approximately elevation 265, the normal sediment pool level. ABSTRACT ABSTRACT

The principal spillway is composed of a single-stage drop inlet riser located within the embankment toe at approximately Station 26 + 50, a 129 foot long, 3.5 foot x 5.0 foot monolithic reinforced concrete conduit and an SAF stilling basin. The riser weir crest is at elevation 267.5 and the downstream channel elevation is 256. The pond drain consists of a 42-inch diameter reinforced pipe with an invert at elevation 258.5. A pipe is located at the upstream toe of the dam and discharges through the principal spillway conduit. The pond drain sluice gate is inside the riser and a hoist is

on top of the riser. The discharge conduit has five anti-seep collars, located as shown on Plate 5, Appendix E.

The emergency spillway is at the left abutment. The grass-lined emergency spillway channel is approximately 400 feet wide and the 1,000 foot long level control section at elevation 283.6 is parallel to the principal spillway. A small stream flows through the emergency spillway. See Plate 6, Appendix E. The channel discharges into the downstream valley, meeting the principal spillway discharge channel approximately 250 feet downstream of the stilling basin.

b. Location. The dam is located on Pine Run in Doylestown Township, Bucks County, Pennsylvania. The dam site is located approximately 3/4 of a mile due north of New Britain, Pennsylvania, northwest of Route 202. The dam site and reservoir are shown on USGS Quadrangle entitled "Doylestown, Pennsylvania" at coordinates N 40° 18.5' W 75° 10.9'. A regional location plan of Pine Run Dam is enclosed as Plate 1, Appendix E.

c. Size Classification. The dam is classified as an "Intermediate" size dam by virtue of its 3,440 acre-foot total storage capacity.

d. Hazard Classification. A "High" hazard classification is assigned consistent with the potential for extensive property damage and probable loss of life downstream in Chalfont, Pennsylvania, where Pine Run enters Neshaminy Creek.

e. Ownership. The dam is owned by the Neshaminy Water Resources Authority. All correspondence should be sent to Mr. William Taylor, Neshaminy Water Resources Authority, Post Office Box 6, Cross Keys Office Center, 4259 Swamp Road, Doylestown, Pennsylvania 18901.

f. Purpose of Dam. The purpose of this dam is flood control. Pine Run Dam is one of ten proposed or constructed flood control structures located within the Neshaminy drainage basin.

g. Design and Construction History. Pine Run Dam was constructed as a flood-retarding structure under the provisions of the Watershed Protection and Flood Prevention Act. The dam was designed by the Soil Conservation Service (SCS) and personnel from SCS provided resident engineering and inspection services throughout construction. The application to construct this dam was submitted on November 10, 1971, and the "Report Upon the Application" prepared by the State of Pennsylvania was issued June 7, 1972. Construction began in the fall of 1972, by Curtis T. Bedwell & Sons, Inc. of West Chester, Pennsylvania, the prime contractor. Reservoir clearing was performed by the Harlow Contracting & Equipment

Rentals Company. The dam was certified completed by SCS on August 27, 1974.

The resident engineers for the SCS were Messrs. Frederick H. Schuetz and James Metz. Additional inspectors included Messrs. Harlin Kemmerer, Russell Campbell, Barry Kintzer and Woodrow Malloch.

Construction progress reports prepared by Mr. Schuetz were submitted monthly to the State. Documents indicate that embankment materials were placed in accordance with specification requirements. Specifically, all embankment density tests met or exceeded minimum specification requirements of at least 95 percent of the Standard Proctor (ASTM D 698). Many construction summary records regarding the work are located in DER files, which were reviewed for this report.

h. Normal Operating Procedures. Under normal conditions, the pond drain gate is closed and water flows over the intake riser weirs through the principal spillway. A memorandum in DER files issued by the Bucks County Planning Commission, dated December 19, 1974, indicates that minimum flow downstream shall not be less than 1.48 cfs. The memorandum reported the flow is maintained by partially opening the pond drain gate.

Excess water is stored up to elevation 283.6. Thereafter, water is discharged through the emergency spillway at the left abutment.

1.3 Pertinent Data.

A summary of pertinent data for Pine Run Dam is presented as follows.

a.	Drainage Area (sq miles) (including drainage area of stream through emergency spillway)	9.89
b.	Discharge at Dam Site (cfs) Maximum Known Flood at Site At Design High Water At Top of Dam	Unknown 5,987 24,613
c.	Elevation (feet above MSL) Top of Dam Design High Water Emergency Spillway Crest Principal Spillway Weir Crest	287.8 285.3 283.6 267.5

	Pond Drain Invert	258.5
	Outlet Invert	256.0
d.	Reservoir (miles)	
	Length at Normal Pool	1.5
	Fetch at Normal Pool	1.5
e.	Storage (acre-feet)	
	Sediment Pool	128
	Normal Pool	128
	To Emergency Spillway Crest	2,244
	To Top of dam	3,441
f.	Reservoir Surface (acres)	
	Sediment/Normal Pool	39
	At Top of Dam	321
g.	Dam Data	
	Type	Rolled earth
	Volume	122,000 cu yd
	Length	2,700 feet
	Maximum Height	31 feet
	Top Width	14 feet
	Side Slope	
	Upstream	3H:1V
	Downstream	2.5H:1V
	Cutoff	Trench under dam centerline.
	Grout Curtain	None
h.	Principal Spillway	
	Type	Single-stage reinforced concrete drop inlet riser with a 3.5' x 5.0' concrete conduit and a reinforced SAF - type stilling basin.
	Reservoir Drain	42 inch diameter RCP connected to riser.
	Elevations (feet)	
	Weir	267.5
	Pond Drain Invert	258.5
	Conduit Outlet Invert	256.0
	Energy Dissipator	SAF stilling basin
i.	Emergency Spillway	
	Type	Grass-lined spillway at left abutment.
	Size	1,000' wide control section and 400' wide discharge channel.
	Side Slopes	3H:1V

SECTION 2 ENGINEERING DATA

2.1 Design.

a. Data Available. A summary of engineering data on Pine Run Dam is attached as Appendix A. Engineering data available for review is contained in a several hundred page design folder prepared by the United States Department of Agriculture, Soil Conservation Service (SCS), and a 44-page set of as-built drawings supplied by the Owner. These drawings were prepared by the SCS. In addition, other data included the "Report Upon the Application of the Neshaminy Water Resources Authority" submitted by the State of Pennsylvania and dated June 7, 1972. Other documentation included miscellaneous letters, correspondence and monthly construction reports prepared the SCS resident engineer.

b. Design Features. The principal design features of Pine Run Dam are illustrated on the plans and profiles enclosed in Appendix E as Plates 2 through 9. These plates were reproduced from as-built drawings prepared by the SCS. A detailed description of the design features is also described in Section 1.2, paragraph a, and pertinent data relative to the structure is presented in Section 1.3.

2.2 Construction.

Details of construction are presented in Section 1.2, paragraph g. Construction records used for the review of this project were obtained in Department of Environmental Resources (DER) files located in Harrisburg, Pennsylvania.

2.3 Operational Data.

There are no operational records maintained. Although the minimum flow requirements are not noted in the permit nor could they be confirmed with the Owner's representative, a memo dated December 19, 1974, by the Bucks County Planning Commission indicates that a minimum flow of 1.48 cfs is required downstream of the structure, and measuring weirs were above and below the reservoir. There are no water level measurements or rainfall records maintained within this watershed.

2.4 Evaluation.

a. Availability. All engineering data evaluated and reproduced for this report was provided by the Pennsylvania DER, SCS or by the Owner.

b. Adequacy. The data included in State files, supplemented with data obtained from Bucks County and information received from State and County representatives, are considered adequate to evaluate the dam and appurtenant structures.

c. Validity. There is no reason to question the validity of this data.

SECTION 3 VISUAL INSPECTION

3.1 Findings.

a. General. Observations and comments of the field inspection team are contained in the checklist enclosed herein as Appendix B, and are summarized and evaluated as follows. In general, the dam and its appurtenant structures are considered to be in fair condition as the embankment is in need of a great deal of minor maintenance. At the time of inspection, stream flow was passing through the riser of the principal spillway, preventing access into the riser or inspection of the discharge conduit.

b. Dam. During the visual inspection, there were no indications of distortion in alignment or grade that would be indicative of movement of the embankment or foundation. Vegetative cover on the upstream slope is considered in poor condition and has patchy areas with scattered erosion all along the slope. Erosion has usually started in areas of trail bike traffic. Along the shoreline there is some embankment erosion since the slope is not protected with riprap or vegetation at the waterline.

The embankment crest is also considered to be in poor condition as it contains ruts up to 16 inches in depth with areas of ponded water and mud. The downstream slope also contains patchy areas of vegetation and erosion which can be attributed to trail bike traffic. One gully measured about 14 inches deep; see Photographs 12 and 13.

The vertical and horizontal alignments were checked and found to be satisfactory except for ruts in the road. Junctions between the embankment and abutment and the embankment and spillway are judged to be in good condition with no excessive erosion or deterioration. There is no seepage observed, although ponded water and soft areas were noted beyond the downstream toe. These soft wet areas are attributed to poor grading of the area and not due to seepage through the embankment. Embankment drains discharging into the stilling basin were observed to be flowing clear and appeared to be functioning as designed.

c. Appurtenant Structures.

1. Principal Spillway. As shown on Photograph 1, the riser is located within the upstream bench at the shoreline. The exposed portions of the riser were inspected

and evaluated to be in good condition with no signs of excessive concrete deterioration, spalling or other structural deficiencies or defects. Some minor debris was clogged in the trash racks of the spillway, which should be removed during routine maintenance. The interior of the intake riser could not be inspected as water was flowing through the principal spillway. It is noted that one grating was missing from the top of the riser, which is considered to be a safety hazard. The pond drain sluice gate could not be exercised since a stem cap was attached to the top of the hoist, preventing the stem from rising.

The outlet channel was inspected and observed to be in poor condition as there is insufficient riprap along the channel banks to prevent erosion and bank undercutting. The construction photographs in DER files, dated November 20, 1973, show that the first downstream bend was not protected with riprap. Thus, the observed erosion would have been expected. The condition of the downstream channel does not affect the safety of the dam.

2. Emergency Spillway. The grass-lined emergency spillway at the left abutment was inspected and found to be stable and in fairly good condition. There is minor erosion of the walls, and vegetation is spotty in places on the floor of the channel with some ponded water. It is noted that this channel contains a small stream going through the center of the channel, which is lined on either side with woody vegetation and trees. This vegetation should be cut during normal maintenance of the embankment. The stream channel side slopes are reasonably well vegetated and appear to be in good condition.

d. Reservoir. At the time of inspection, the pond was at sediment pool elevation. The reservoir slopes are well vegetated to the water's edge. Considerable debris was noted along the waterline, which could partially block flow through the principal spillway.

e. Downstream Channel. As shown on Plate 1, Appendix E, Pine Run flows west of New Britain to the North Branch of Neshaminy Creek at Chalfont, Pennsylvania, near the intersection of Routes 202 and 152. About 2.3 miles above the confluence of Pine Run with the North Branch, Peace Valley Dam NDS ID PA 00790 is across the North Branch. Peace Valley Dam is a multiple-purpose dam controlling 15.8 square miles of drainage area. Between the dam and the North Branch, the stream's 20 foot wide channel and three foot high banks are stable with a valley gradient of about 0.0015. Less than one mile below the dam is a housing development with some of the

houses subject to damage. About two miles below the dam, Pine Run flows through Chalfont, Pennsylvania, which is a highly populated area, clearly justifying a "High" hazard classification.

3.2 Evaluation.

Inspection of the dam and appurtenant facilities disclosed no evidence of apparent past or present movement that would indicate existing instability of the dam, principal or emergency spillways. Interior portions of the principal spillway and discharge pipe could not be inspected due to flow through the system. The principal spillway discharge channel was inspected and found to be in fair condition with some bank undercutting and a lack of suitable riprap protection to minimize this deterioration and erosion. The emergency spillway channel and area below the dam were observed to be in good condition. The reservoir shoreline contains debris and other materials which could float and partially clog the principal spillway. The crest of the dam contains soft muddy areas with other areas of erosion associated with trail bike traffic. Although the slopes are considered to be poorly maintained and in need of repairs, the overall classification of the dam's condition is judged as fair.

SECTION 4 OPERATIONAL PROCEDURES

4.1 Procedures.

Operational procedures are discussed in some detail in Section 1.2. Operation of the dam does not require a dam tender. Under normal conditions, flow discharges over the weir of the principal spillway and through the 3.5 foot by 5 foot conduit at the base of the embankment. Excess water is stored and then discharged over the crest of the emergency spillway. As reported by the Owner's representatives, water has never flowed over the emergency spillway. It is reported by the Owner's representative that operational and maintenance procedures are currently being prepared for the entire Neshaminy watershed. It is reported that these procedures will be issued shortly.

4.2 Maintenance of the Dam.

The dam is maintained by the Neshaminy Water Resources Authority who periodically check the embankment, mow the grass and remove woody vegetation. Apparently, based on the condition of the dam, this work has not been done recently.

4.3 Maintenance of Operating Facilities.

Maintenance of these facilities includes cleaning debris from the intake systems and checking the structural integrity of the system.

4.4 Warning Systems In Effect.

Neshaminy Water Resources Authority representatives indicate that a warning system is being developed for the Neshaminy watershed and will be implemented as soon as practical.

4.5 Evaluation.

It is judged that the current operating procedure, which does not require a dam tender, is a realistic means of operating the relatively simple control facilities at Pine Run Dam.

In conclusion, it is noted that formal operational/maintenance and warning procedures are currently being developed and will be implemented as soon as practical. It should be noted that these procedures should include an inspection checklist, which would include a listing of items that should be checked during each inspection and repaired as necessary to insure proper performance of the structure.

SECTION 5 HYDROLOGY/HYDRAULICS

5.1 Evaluation of Features.

a. Design Data. The complete folder of design calculations was reviewed and portions of this folder are presented in Appendix C.

The watershed is about six miles long and from 0.25 to 2.25 miles wide, having a total area of approximately 9.89 square miles. An unusual feature of this dam is the stream, with a drainage area of about 0.3 square miles, flowing through the emergency spillway. Elevations range from 540 in the upper reaches to 267.5 at normal pool elevation. The watershed is predominantly open/farmland with 25 to 35 percent residential development. Residential development can be expected to progress rapidly.

In accordance with criteria established by Federal (OCE) Guidelines, the recommended spillway design flood for this "Intermediate" size dam and "High hazard classification is the Probable Maximum Flood (PMF). The Soil Conservation Service designed this dam as a Class C structure, which requires that the spillway systems be designed to pass the PMF.

b. Experience Data. There are no records of reservoir levels kept for this dam. Rainfall is measured and records are kept at the Neshaminy Water Resources Authority's office in nearby Cross Keys, Doylestown, Pennsylvania. There are no estimates or records of previous high water levels.

c. Visual Observations. On the date of inspection, the only condition observed that could indicate a possible reduction in emergency spillway capacity is the growth of fairly large trees along the stream in the emergency spillway. The trees would tend to prevent discharge from the reservoir from flowing over the entire width of the emergency spillway. Debris around the reservoir may also partially clog the principal spillway. Observations regarding the condition of the downstream channel, spillways and reservoir are located in Appendix B and discussed in greater detail in Section 3.

d. Overtopping Potential. The dam was designed to pass the PMF without overtopping. The PMF inflow hydrograph and flood routing are presented in Appendix C. This information was reviewed, evaluated and judged to be adequate. In summary, the peak inflow was computed as 25,878 cfs resulting

from a six-hour storm with 25.5 inches of rainfall, producing 22.89 inches of runoff. The storm was routed through the reservoir to produce a peak discharge of 24,613 cfs and maximum water level elevation 287.8 at the top of the dam. Spillway systems for this dam are considered to be "Adequate" as the dam will pass the PMF without overtopping.

e. Downstream Conditions. Pine Run enters the North Branch of Neshaminy Creek about 1.9 miles below the dam. About 3,000 feet farther downstream, the North Branch enters Neshaminy Creek. Pine Run Dam, together with Peace Valley Dam in the adjacent valley, provides relief from flooding in the rapidly urbanizing area. However, a high potential for flood damage still exists downstream of the structures. It is estimated that damage from flooding has been reduced but not eliminated through control of the upper reaches of the Neshaminy Watershed by flood control structures. In conclusion, it is evaluated that significantly greater downstream damage would result from failure of the dam during a PMF than damage resulting from large flows during passage of the PMF.

SECTION 6 STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability.

a. Visual Observations. Visual observations detected no evidence of existing or impending embankment instability. Upstream and downstream slopes were stable, with no surficial slides or other indications of deep-seated instability. However, there is some potentially serious erosion, a lack of dense vegetation, and other indications of lack of surficial maintenance. There were no exterior signs or other evidence to indicate that the internal drainage systems were not operating properly.

No signs of seepage were observed at the downstream toe or in areas adjacent to the toe. However, areas of ponded water resulting in wet marshy conditions were noted and assessed to be a result of poor drainage and not of seepage through the embankment or foundation.

Exposed portions of the principal spillway were inspected and judged to be in good condition. It is noted that the pond drain sluice gate was not exercised as a cap was on top of the hoist, preventing the stem from rising. Similarly, the emergency spillway was also inspected and assessed to be in good condition, with some woody vegetation noted along the stream channel which passes through the spillway.

b. Design and Construction Data. Design documentation is very complete as a several hundred page design folder prepared by the Soil Conservation Service (SCS) was available and reviewed for this investigation. Data included in these files are a foundation report and structural calculations for the embankment, pertinent facilities and principal spillway. Also included in this report are a complete set of specifications and an estimate of the quantity of material used in the embankment. The report contains permeability tests, shear strength results and sediment analysis as well as a full stability analysis. The stability analysis for this embankment was performed by the SCS and showed that, for rapid drawdown, the minimum factor of safety was 2.0. A somewhat higher factor of safety was reported for steady state seepage conditions. According to Corps of Engineers' criteria, EM 1110-2-1902, these values are acceptable.

Documents pertaining to design also include a 44-sheet set of drawings prepared by the SCS and stamped "As-

Built". Included in this design folder is a complete set of hydrologic/hydraulic calculations. Principal features of this structure were extracted from these drawings and calculations, and are located in Appendix E and C, respectively. Progress reports prepared by SCS' resident engineer and inspection reports prepared by Department of Environmental Resources representatives indicate that work was performed in accordance with SCS requirements and that all compaction tests exceeded the minimum specification of 95 percent of the Standard Proctor as defined by ASTM D 698. Other testing, such as concrete tests and gradation tests, were also documented in the construction inspector's records to meet specification requirements.

c. Operating Records. There are no operational records for this structure.

d. Post-Construction Changes. There are no reports nor is there any evidence that modifications were made to this dam.

e. Seismic Stability. The dam is located in Seismic Zone 1. Normally it can be considered that if a dam in this zone is stable under static loading conditions, it can be assumed safe for any expected earthquake conditions. As the stability analysis resulted in a minimum factor of safety of two under rapid drawdown conditions, the most critical loading conditions, it can be assumed that seismic stability requirements are satisfied.

SECTION 7 ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment.

a. Evaluation. The visual inspection and review of design and construction documentation indicate that the appurtenant structures of Pine Run Dam are in good condition, while the embankment is in fair condition due to the lack of maintenance of the slopes and crest.

The hydrologic and hydraulic computations presented in Appendix C indicate that the structure will pass the probable maximum flood without overtopping. Therefore, the spillway systems of this structure are considered to be "Adequate". In the event that high flows are passed through the emergency spillway, significant property damage is still likely to occur along Pine Run and especially in the town of Chalfont, Pennsylvania, where there are many homes near the flood plain. In the event the dam fails while retaining a significant quantity of water, extreme property damage and possible loss of life would be expected.

b. Adequacy of Information. Information available for this investigation was sufficiently adequate to evaluate the structure and hydraulic aspects of the basin.

c. Urgency. It is recommended that suggestions presented in Section 7.2 be implemented during routine maintenance of the structure.

7.2 Remedial Measures.

a. Facilities. It is recommended that the following steps be taken immediately.

1. The crest of the dam should be rehabilitated and stabilized with gravel or other materials to prevent deterioration which has occurred due to unauthorized traffic.
2. Erosion on embankment slopes should be corrected and vegetation reestablished in a satisfactory manner on the entire slope of the embankment.
3. Shoreline erosion of the embankment should be stabilized in accordance with the designer's recommendations.

These measures should be taken as soon as practical.

1. If at all possible, suitable devices should be constructed around the dam to prevent or minimize access of trail bikes and other unauthorized vehicles on the crest and embankment.
2. The channel downstream of the spillway should be stabilized with materials to prevent continued erosion and deterioration of the stream banks.
3. Woody vegetation along the stream channel and emergency spillway should be removed during routine maintenance of the structure.

b. Operation and Maintenance Procedures. It is understood that Neshaminy Water Resources Authority is currently preparing operation and maintenance procedures in accordance with SCS guidelines for all existing dams in the Neshaminy Watershed. These procedures should include a checklist to insure that all items are periodically inspected and maintained in the best possible condition. Furthermore, it is also understood that a warning system is also in preparation and will be implemented as soon as practical.

It is recommended that these procedures provide for a period of observation after significant quantities of water are stored behind the embankment. These observations should include monitoring discharge from the embankment drainage system and looking for sources of uncontrolled seepage.

APPENDIX

A

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM Pine Run Dam

ID # PA 00808

ITEM

REMARKS

Sheet 1 of 4

AS-BUILT DRAWINGS

Yes. See Appendix E.

REGIONAL VICINITY MAP

Yes. See Plate 1, Appendix E.

CONSTRUCTION HISTORY

Yes. See Section 1.2, paragraph g of report text.

TYPICAL SECTIONS OF DAM

Yes. See Appendix E.

OUTLETS - PLAN

DETAILS

See Appendix E.

CONSTRAINTS

DISCHARGE RATINGS

See SCS design file in DER files, Harrisburg, Pennsylvania.

RAINFALL/RESERVOIR RECORDS

None available.

ITEM	REMARKS
DESIGN REPORTS	<i>Yes. Complete SCS design package is located in DER files, Harrisburg, Pennsylvania</i>
GEOLOGY REPORTS	<i>Yes. See Appendix F and SCS design folder in DER files.</i>
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	<i>All data in SCS design folder in DER files.</i>
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	<i>See SCS design folder in DER files.</i>
POST-CONSTRUCTION SURVEYS OF DAM	<i>None</i>
BORROW SOURCES	<i>Data located on SCS drawings.</i>

ITEM	REMARKS
MONITORING SYSTEMS	None
MODIFICATIONS	None
HIGH POOL RECORDS	None available.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None
MAINTENANCE OPERATION RECORDS	Yes. SCS has an O & M procedure.

ITEM	REMARKS
SPILLWAY PLAN	See Appendix E.
SECTIONS DETAILS	
OPERATING EQUIPMENT PLANS & DETAILS	See Appendix E.
MISCELLANEOUS	<ol style="list-style-type: none"> 1. SCS Operation and Maintenance reports. 2. Miscellaneous Letters. 3. Water Resources Inventory Form. 4. SCS Construction Inspection reports. 5. 16 construction and inspection photographs.

APPENDIX

B

CHECK LIST
VISUAL INSPECTION
PHASE I

Sheet 1 of 11

Name Dam Pine Run Dam County Bucks State Pennsylvania National ID # PA 00807
Type of Dam Earth Hazard Category I-High
Date(s) Inspection 23 April 1979 Weather Clear and warm Temperature 60's

Pool Elevation at Time of Inspection 267.6[±] M.S.L. Tailwater at Time of Inspection 256.8 M.S.L.

Inspection Personnel:

John Boschuk, Jr. (Geotechnical) Raymond Lambert (Geologist) John H. Frederick (Geotechnical)
Mary F. Beck (Hydrologist) Vincent McKeever (Hydrologist)

John Boschuk, Jr. Recorder

Remarks:

Messrs. William Taylor and Charles Burger of the Neshaminy Water Resources Authority
and Mr. Eugene B. McGough of William G. Major Associates, Inc., were on site
and provided assistance to the inspection team.

CONCRETE/MASONRY DAMS

Sheet 2 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE	N/A	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	N/A	
DRAINS	N/A	
WATER PASSAGES	N/A	
FOUNDATION	N/A	

CONCRETE/MASONRY DAMS

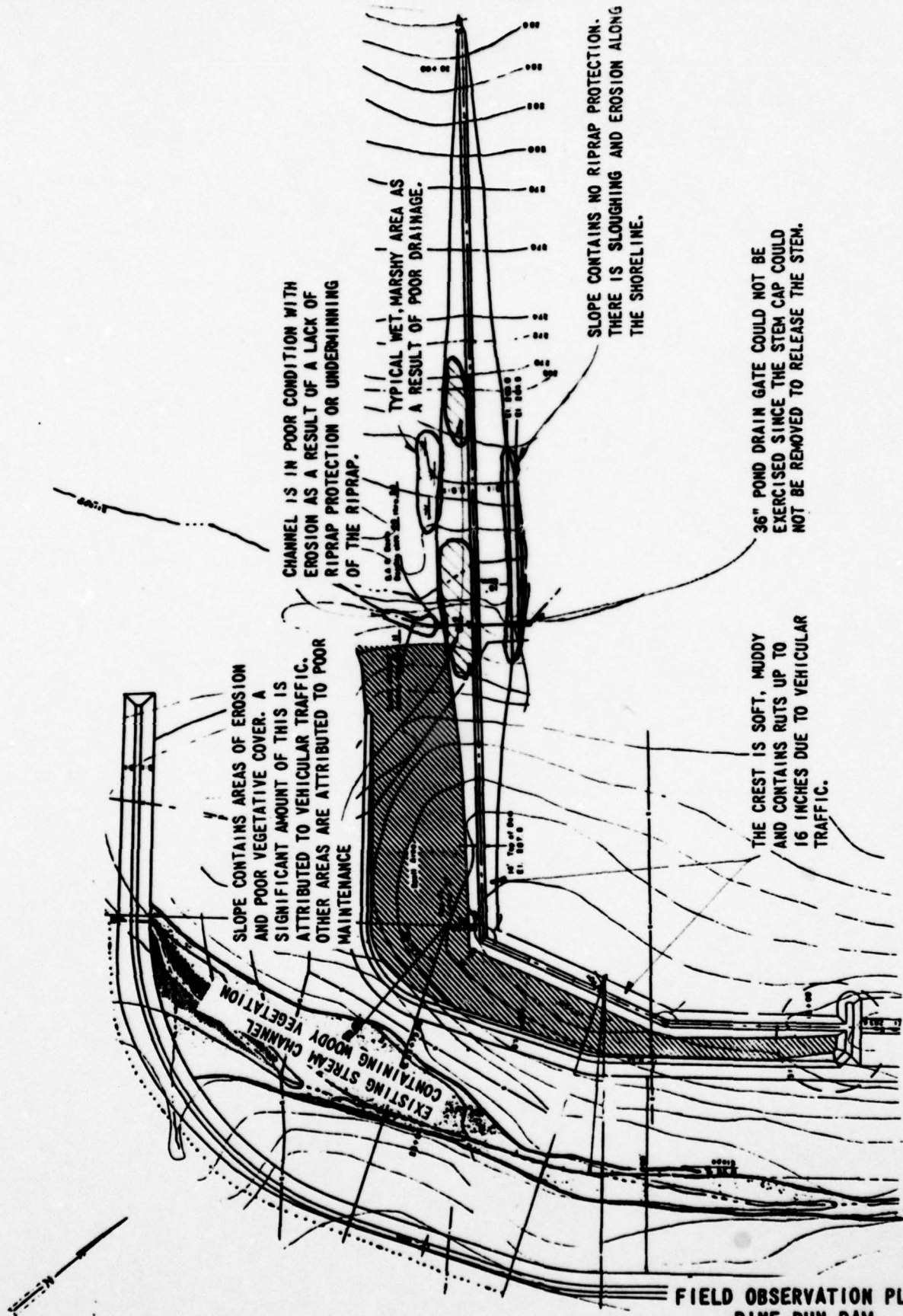
Sheet 3 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	N/A	
STRUCTURAL CRACKING	N/A	
VERTICAL AND HORIZONTAL ALIGNMENT	N/A	
MONOLITH JOINTS	N/A	
CONSTRUCTION JOINTS	N/A	

EMBANKMENT

Sheet 4 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	The embankment crest is in poor condition containing ruts up to 14 to 16 inches in depth with areas of ponded water and mud.	
UPSTREAM SLOPE	The vegetative cover is poor and has "patchy" areas with scattered erosion all along the slope. Erosion has usually started in areas of "trail-bike" traffic.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Slopes contain many areas of erosion and general deterioration of vegetative cover attributed to vehicular traffic on the slope and, to some extent, attributed to the lack of maintenance.	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	The vertical and horizontal alignment was checked and found to be satisfactory except for the ruts in the road.	
RIPRAP FAILURES	No riprap and upstream slope is in poor condition with erosion along shoreline.	



EMBANKMENT

Sheet 5 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
-----------------------	--------------	----------------------------

JUNCTION OF EMBANKMENT
AND ABUTMENT, SPILLWAY
AND DAM

Reasonably good condition.

ANY NOTICEABLE SEEPAGE

None observed but ponded water and soft areas were noted beyond the downstream toe. These areas are attributed to poor grading of the area.

STAFF GAGE AND RECORDER

None

DRAINS

Embankment drains discharging into SAF basin are flowing clear and it appears that the drains are functioning as designed.

OUTLET WORKS

Sheet 6 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	<i>Could not inspect outlet tunnel due to water flowing through the system.</i>	
INTAKE STRUCTURE	<i>Generally good condition. One walkway grading is missing and should be replaced.</i>	
OUTLET STRUCTURE	<i>Good condition. No excessive spalling, cracking or deterioration was observed.</i>	
OUTLET CHANNEL	<i>Fair to poor condition with riprap displacement and general deterioration of the channel. See photographs in Appendix D.</i>	
POND DRAIN	<i>The pond drain gate could not be exercised because of the stem cap would not be removed to allow the gate to be raised.</i>	

UNGATED SPILLWAY

Sheet 7 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
-----------------------	--------------	----------------------------

CONTROL SECTION	The grass covered control section is in reasonably good condition with vegetation spotty in places.	
-----------------	---	--

APPROACH CHANNEL AND DISCHARGE CHANNEL	The channel is in good condition and it is noted that a small stream currently passes through the channel as shown on Sheet 5a, Appendix B. This creek is lined with woody vegetation and small willow trees which should be removed during annual maintenance of the structure.	
--	--	--

BRIDGE AND PIERS	N/A	
------------------	-----	--

GATED SPILLWAY

Sheet 8 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	N/A	
APPROACH CHANNEL	N/A	
DISCHARGE CHANNEL	N/A	
BRIDGE AND PIERS	N/A	
GATES AND OPERATION EQUIPMENT	N/A	

INSTRUMENTATION

Sheet 9 of 11

<u>VISUAL EXAMINATION</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
MONUMENTATION/SURVEYS	None	
OBSERVATION WELLS	None	
WEIRS	None	
PIEZOMETERS	None	
OTHER	None	

RESERVOIR

Sheet 10 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
-----------------------	--------------	----------------------------

SLOPES

Reservoir slopes are moderate and vegetated to water's edge with grass and few trees.

SEDIMENTATION

Little or no sedimentation, no effect on flood storage.

DOWNSTREAM CHANNEL

Sheet 11 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
-----------------------	--------------	----------------------------

CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Some bank undercutting and erosion has occurred immediately downstream of the riprapped outlet channel for the principal spillway.	
--	---	--

SLOPES

The valley gradient is about 0.0015.

APPROXIMATE NO.
OF HOMES AND
POPULATION

Less than one mile below the dam is a housing development with some
of the houses subject to damage. About two miles below the dam, Pine
Run flows through Chalfont, Pennsylvania.

APPENDIX

C

PINE RUN DAM
CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: Predominantly open/farm land, 25-35% developed.

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 267.5 feet (128 Acre-Feet).

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 287.8 feet (3441 Acre-Feet).

ELEVATION MAXIMUM DESIGN POOL: 285.3 Design High Water.

ELEVATION TOP DAM: 287.8 feet.

EMERGENCY SPILLWAY

a. Elevation 283.6 feet.

b. Type Grass lined trapezoidal channel.

c. Width 1000 feet.

d. Length 3000 feet.

e. Location Spillover Left abutment.

f. Number and Type of Gates None.

PRINCIPAL SPILLWAY

a. Type Drop inlet riser, conduit and SAF stilling basin.

b. Location Station 26+50.

c. Entrance inverts 267.5 feet.

d. Exit inverts 256.0 feet.

e. Emergency draindown facilities 42-inch pipe at elevation 258.5 feet.

HYDROMETEOROLOGICAL GAGES:

a. Type Standard rain gage.

b. Location Neshaminy Water Resources Authority office at Cross Keys,
Pennsylvania.

c. Records Kept at Cross Keys, three miles from dam.

MAXIMUM NON-DAMAGING DISCHARGE: Not estimated.

**PINE RUN DAM
Hydrology/Hydraulics**

**Classification (Ref.-Recommended Guidelines for Safety
Inspection of Dams).**

1. The hazard potential is rated as "High" as there would be loss of life if the dam failed.
2. The size classification is "Intermediate" based on 3441 Acre-Feet total storage capacity.
3. The spillway design flood, based on size and hazard classification, is the Probable Maximum Flood (PMF).

Hydrologic/Hydraulic Analysis

The complete H & H design folder was available for review. The PMF inflow hydrograph was determined according to procedures in the SCS National Engineering Handbook, Section 4. Hydrograph calculations and flood routing were performed by the SCS computer program, TR-20. Portions of the original design folder are included in this Appendix.

Original design parameters were checked against current information and/or criteria. The drainage area on Sheet 4 is listed as 9.89 square miles. Most drains through the reservoir and some through the emergency spillway. Measurements from USGS maps for this investigation disclose 9.6 square miles drains through the reservoir and an additional 0.3 square miles drains through emergency spillway.

Calculations for the inflow hydrograph were based on a 6-hour rainfall of 25.5 inches. Rainfall criteria established for this investigation by the Corps of Engineers indicate a 26.6 inch rainfall (Ref. Hydrometeorological Report No. 33) and the use of Hop Brook factor, a point rainfall reduction factor. For a watershed of this size, the point rainfall is reduced by 20%, or to 21.2 inches. Thus, the design rainfall is conservative compared to Corps of Engineers criteria.

The "No-Freeboard" hydrograph (PMF) is calculated based on Runoff Curve Number 81 (CN 81). CN 81 is based on the hydrologic soil groups classification and expected future land use within the watershed. The future land use was

based on projections of the Bucks and Montgomery Planning Commission to year 2010. Projected land use includes commercial, 1%; industrial, 5%; and residential, 22% for a total developed area of 28%. The estimated current developed area of 28%. The estimated current developed area is between 25 and 35% from the 1973 USGS maps. As development, particularly industrial and commercial, increases the CN (and amount of rainfall runoff), the possibility exists that the adequacy of the PMF inflow hydrograph may have to be re-evaluated at a future date.

Based on review of the design folder and the above evaluation of design assumptions and data input, the original PMF flood routing is judged adequate for the present.

State <u>PA</u>	Project <u>NESHAMINY CREEK W/S</u>
By <u>G.V.B.</u>	Date <u>15 SEP 70</u>
Checked By	Date
Job No <u>PA-616</u>	
Subject <u>WORK PLAN - DESIGN COMPARISON</u>	Sheet <u> </u> of <u> </u>

ITEM	UNIT	WORK PLAN	DESIGN	COMMENTS
<u>DRAINAGE AREA</u>	SQ MI.	<u>9.39</u>	<u>9.89</u>	
<u>STORAGE CAPACITY</u>				
SEDIMENT (INC. AERATED)	AC FT.	<u>204</u>	<u>204</u>	
BENEFICIAL	AC FT.			
RETARDING	AC FT.	<u>1794</u>	<u>2029</u>	
TOTAL	AC FT.	<u>1998</u>	<u>2233</u>	
BETWEEN HIGH & LOW S.	AC FT.	<u>—</u>	<u>—</u>	
<u>SURFACE AREA</u>				
NORMAL POOL	ACRE	<u>39</u>	<u>39</u>	
RETARDING POOL	ACRE	<u>228</u>	<u>242</u>	
DESIGN HIGH WATER	ACRE			
<u>VOLUME OF FILL</u>	CU YD.	<u>107,100</u>		
<u>TOP OF DAM ELEV</u>	FEET	<u>287.3</u>	<u>287.8</u>	
<u>MAX. HEIGHT OF DAM</u>	FEET	<u>30.0</u>	<u>30.0</u>	
<u>EMERGENCY SPILLWAY</u>				
CREST ELEVATION	FEET	<u>282.8</u>	<u>283.6</u>	
BOTTOM WIDTH	FEET	<u>850.0</u>	<u>1000</u>	
TYPE	—	<u>500</u>	<u>500</u>	
PERCENT CHANCE OF USE	—	<u>1</u>	<u>1</u>	
AVE CURVE NO COND. II	—	<u>81</u>	<u>81</u>	
<u>EM. SP. HYDROGRAPH</u>				
STORM RAINFALL - 6 HR.	IN.	<u>10.5</u>	<u>10.5</u>	
STORM RUNOFF	IN.	<u>8.12</u>	<u>8.12</u>	
VELOCITY OF FLOW - V	FPS	<u>6.3</u>	<u>6.2</u>	
PEAK DISCHARGE RATE	CFS	<u>4930</u>	<u>5445</u>	
MAX. WATER SURFACE EL	FEET	<u>286.6</u>	<u>285.3</u>	CHECK BY TM-25 + COMPUTER
<u>FREEBOARD HYDROGRAPH</u>				
STORM RAINFALL - 6 HR.	IN.	<u>25.5</u>	<u>25.5</u>	
STORM RUNOFF	IN.	<u>22.89</u>	<u>22.89</u>	
VELOCITY OF FLOW - V	FPS	<u>10.6</u>	<u>11.0</u>	
PEAK DISCHARGE RATE	CFS	<u>24160</u>	<u>24847</u>	
MAX WATER SURFACE EL	FEET	<u>287.3</u>	<u>287.8</u>	CHECK BY TM-25 + COMPUTER
<u>PRINCIPAL SPILLWAY</u>				
RISER SIZE	FT.	<u>—</u>	<u>5x15</u>	TRANSITION RNER
MAX. LOW STAGE FLOW	CFS	<u>—</u>	<u>—</u>	
ORIFICE SIZE	FT.	<u>—</u>	<u>—</u>	
MAX. HIGH STAGE FLOW	CFS	<u>—</u>	<u>524</u>	WORK ALSO TO BE AMENDED
PIPE SIZE	DIA.	<u>—</u>	<u>3.5'x5.0'</u>	APPROXIMATE CONDUIT
<u>CAPACITY EQUIVALENTS</u>				
TOTAL SEDIMENT VOL.	IN.	<u>0.41</u>	<u>0.387</u>	
RETARDING STORAGE	IN.	<u>3.50</u>	<u>3.78</u>	
EM. SPILLWAY STORAGE TO TOP OF DAM	IN.	<u>2.50</u>	<u>2.18</u>	
<u>CLASS OF STRUCTURE</u>	—	<u>C</u>	<u>C</u>	
<u>CONSTRUCTION COSTS</u>				
				Ref: SCS Design Folder
<u>B-C RATIO</u>				

U. S. DEPARTMENT OF AGRICULTURE
BUREAU OF ENTOMOLOGY

WESHAMING CREEK W'S

Case	Case	Case	Case
1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16
17	18	19	20
21	22	23	24
25	26	27	28
29	30	31	32
33	34	35	36
37	38	39	40
41	42	43	44
45	46	47	48
49	50	51	52
53	54	55	56
57	58	59	60
61	62	63	64
65	66	67	68
69	70	71	72
73	74	75	76
77	78	79	80
81	82	83	84
85	86	87	88
89	90	91	92
93	94	95	96
97	98	99	100

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466
---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

present | w3

	0809	C
--	------	---

COVER	SOURCE	TYPE	DATE

ME 41 20603

COPIES OF

100

—

—

+

—

—

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100
101
102
103
104
105
106
107
108
109
110
111
112
113
114
115
116
117
118
119
120
121
122
123
124
125
126
127
128
129
130
131
132
133
134
135
136
137
138
139
140
141
142
143
144
145
146
147
148
149
150
151
152
153
154
155
156
157
158
159
160
161
162
163
164
165
166
167
168
169
170
171
172
173
174
175
176
177
178
179
180
181
182
183
184
185
186
187
188
189
190
191
192
193
194
195
196
197
198
199
200
201
202
203
204
205
206
207
208
209
210
211
212
213
214
215
216
217
218
219
220
221
222
223
224
225
226
227
228
229
230
231
232
233
234
235
236
237
238
239
240
241
242
243
244
245
246
247
248
249
250
251
252
253
254
255
256
257
258
259
260
261
262
263
264
265
266
267
268
269
270
271
272
273
274
275
276
277
278
279
280
281
282
283
284
285
286
287
288
289
290
291
292
293
294
295
296
297
298
299
300
301
302
303
304
305
306
307
308
309
310
311
312
313
314
315
316
317
318
319
320
321
322
323
324
325
326
327
328
329
330
331
332
333
334
335
336
337
338
339
340
341
342
343
344
345
346
347
348
349
350
351
352
353
354
355
356
357
358
359
360
361
362
363
364
365
366
367
368
369
370
371
372
373
374
375
376
377
378
379
380
381
382
383
384
385
386
387
388
389
390
391
392
393
394
395
396
397
398
399
400
401
402
403
404
405
406
407
408
409
410
411
412
413
414
415
416
417
418
419
420
421
422
423
424
425
426
427
428
429
430
431
432
433
434
435
436
437
438
439
440
441
442
443
444
445
446
447
448
449
450
451
452
453
454
455
456
457
458
459
460
461
462
463
464
465
466
467
468
469
470
471
472
473
474
475
476
477
478
479
480
481
482
483
484
485
486
487
488
489
490
491
492
493
494
495
496
497
498
499
500
501
502
503
504
505
506
507
508
509
510
511
512
513
514
515
516
517
518
519
520
521
522
523
524
525
526
527
528
529
530
531
532
533
534
535
536
537
538
539
540
541
542
543
544
545
546
547
548
549
550
551
552
553
554
555
556
557
558
559
560
561
562
563
564
565
566
567
568
569
570
571
572
573
574
575
576
577
578
579
580
581
582
583
584
585
586
587
588
589
590
591
592
593
594
595
596
597
598
599
600
601
602
603
604
605
606
607
608
609
610
611
612
613
614
615
616
617
618
619
620
621
622
623
624
625
626
627
628
629
630
631
632
633
634
635
636
637
638
639
640
641
642
643
644
645
646
647
648
649
650
651
652
653
654
655
656
657
658
659
660
661
662
663
664
665
666
667
668
669
670
671
672
673
674
675
676
677
678
679
680
681
682
683
684
685
686
687
688
689
690
691
692
693
694
695
696
697
698
699
700
701
702
703
704
705
706
707
708
709
710
711
712
713
714
715
716
717
718
719
720
721
722
723
724
725
726
727
728
729
730
731
732
733
734
735
736
737
738
739
740
741
742
743
744
745
746
747
748
749
750
751
752
753
754
755
756
757
758
759
760
761
762
763
764
765
766
767
768
769
770
771
772
773
774
775
776
777
778
779
780
781
782
783
784
785
786
787
788
789
790
791
792
793
794
795
796
797
798
799
800
801
802
803
804
805
806
807
808
809
810
811
812
813
814
815
816
817
818
819
820
821
822
823
824
825
826
827
828
829
830
831
832
833
834
835
836
837
838
839
840
84

[illegible]

100

100

10

1

100

—

1000

100

1

1

100

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	52
--	---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----

100

100

1

© 2004 Blackwell Publishing Ltd, *Journal of Internal Medicine* 255: 103–110

100

100

*% Based on Bucks & Montgomery Planning Commission projection Year 2010-

Ref. SCS Design Folder -

E. S. DESIGN AND FREEBOARD ROUTINGS.

NESHAMINY CREEK PA-616

JUL 4/70

CURVE NO. 81. TC 4.71 STORM DURATION 6.00

EMER. SPH. RAINFALL 10.50 FREEBOARD RAINFALL 25.50

CASE NO. 2. DRAINAGE AREA 9.89 EMER. SPH. CREST 283.5

B01 600. L1 100. B02 850. L2 100. B03 1000. L3 100. used.

ELEVATION	STORAGE	CFS	CFS	CFS
267.50	203.	0.	0.	0.
268.00	203.	31.	31.	31.
268.50	203.	87.	87.	87.
269.00	203.	160.	160.	160.
269.50	230.	246.	246.	246.
270.00	260.	343.	343.	343.
272.00	400.	388.	388.	388.
274.00	575.	415.	415.	415.
276.00	810.	440.	440.	440.
278.00	1105.	464.	464.	464.
280.00	1450.	486.	486.	486.
283.50	2175.	524.	524.	524.
284.00	2280.	877.	1022.	1109.
284.50	2425.	1698.	2183.	2474.
285.00	2550.	2891.	3871.	4459.
285.50	2700.	4384.	5984.	6944.
286.00	2815.	6417.	8862.	10329.
286.50	2995.	8474.	11774.	13754.
287.00	3150.	10879.	15177.	17758.
287.50	3300.	13463.	18838.	22063.
288.00	3490.	16408.	23008.	26968.
288.49	3620.	19561.	27472.	32219.

Ref: SCS Design Folder

FREEBOARD ROUTING.

NESHAMINY CREEK PA-616

JUL 4/70

80 = 1000. L = 100.

TIME	INFLOW	AVE IN	OUTFLOW	ELEV.
0.25	15.	7.	15.	267.74
0.50	31.	23.	31.	268.00
0.75	47.	39.	47.	268.14
1.00	156.	102.	155.	268.97
1.25	294.	225.	164.	269.02
1.50	431.	362.	177.	269.10
1.75	925.	678.	210.	269.29
2.00	1724.	1325.	283.	269.69
2.25	2522.	2123.	349.	270.26
2.50	3672.	3097.	367.	271.07
2.75	5601.	4637.	391.	272.26
3.00	7531.	6566.	411.	273.72
3.25	9521.	8526.	430.	275.21
3.50	12195.	10858.	450.	276.83
3.75	14869.	13532.	470.	278.57
4.00	17543.	16206.	490.	280.37
4.25	19646.	18595.	509.	282.18
4.50	21650.	20648.	1386.	284.10
4.75	23654.	22652.	6822.	285.47
5.00	24738.	24196.	13515.	286.46
5.25	25264.	25001.	18333.	287.06
5.50	25790.	25527.	21623.	287.44
5.75	25878.	25834.	23431.	287.63
6.00	25287.	25583.	24337.	287.73
6.25	24696.	24992.	24613.	287.76
6.50	24018.	24357.	24505.	287.74
6.75	22886.	23452.	24062.	287.70
7.00	21755.	22321.	23329.	287.62
7.25	20624.	21190.	22428.	287.53
7.50	19355.	19990.	21344.	287.41
7.75	18076.	18716.	20142.	287.27
8.00	16797.	17437.	18905.	287.13

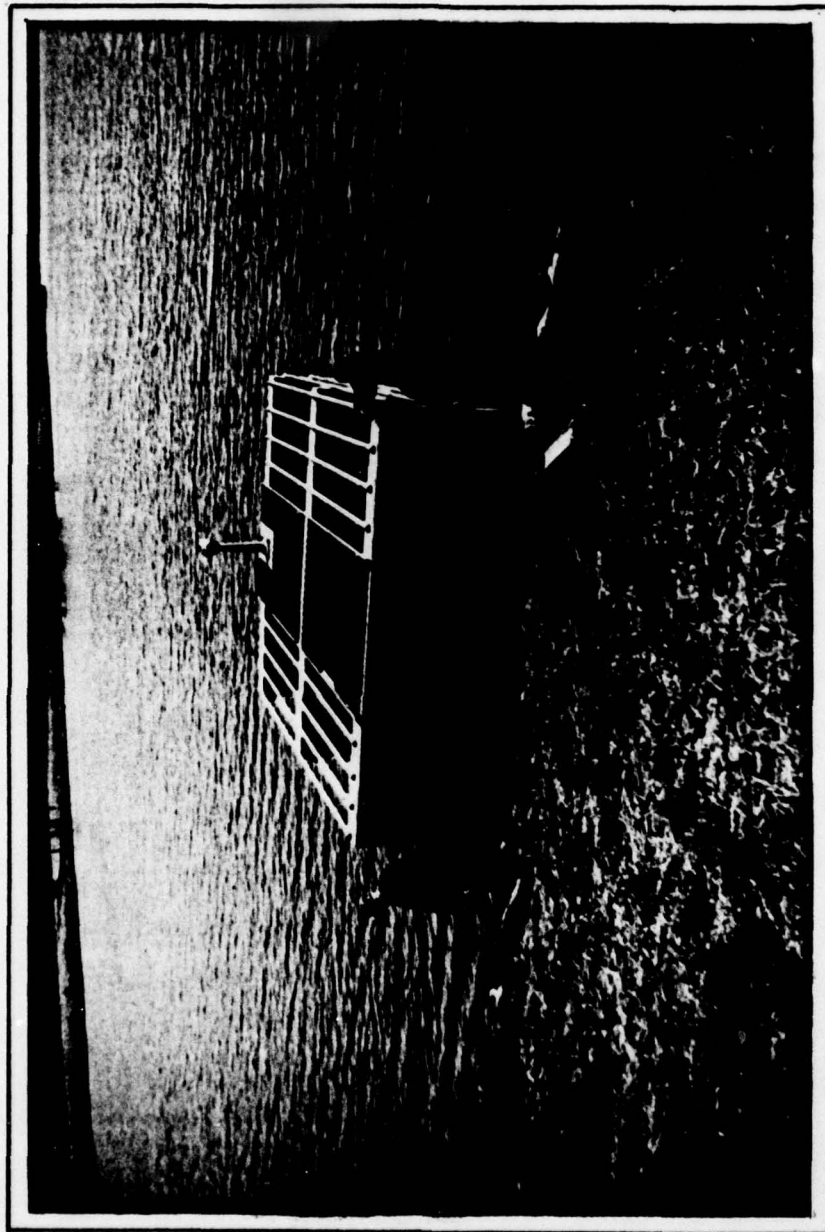
Ref: SCS Design Folder

Top of Dam 287.8

PEAK

APPENDIX

D



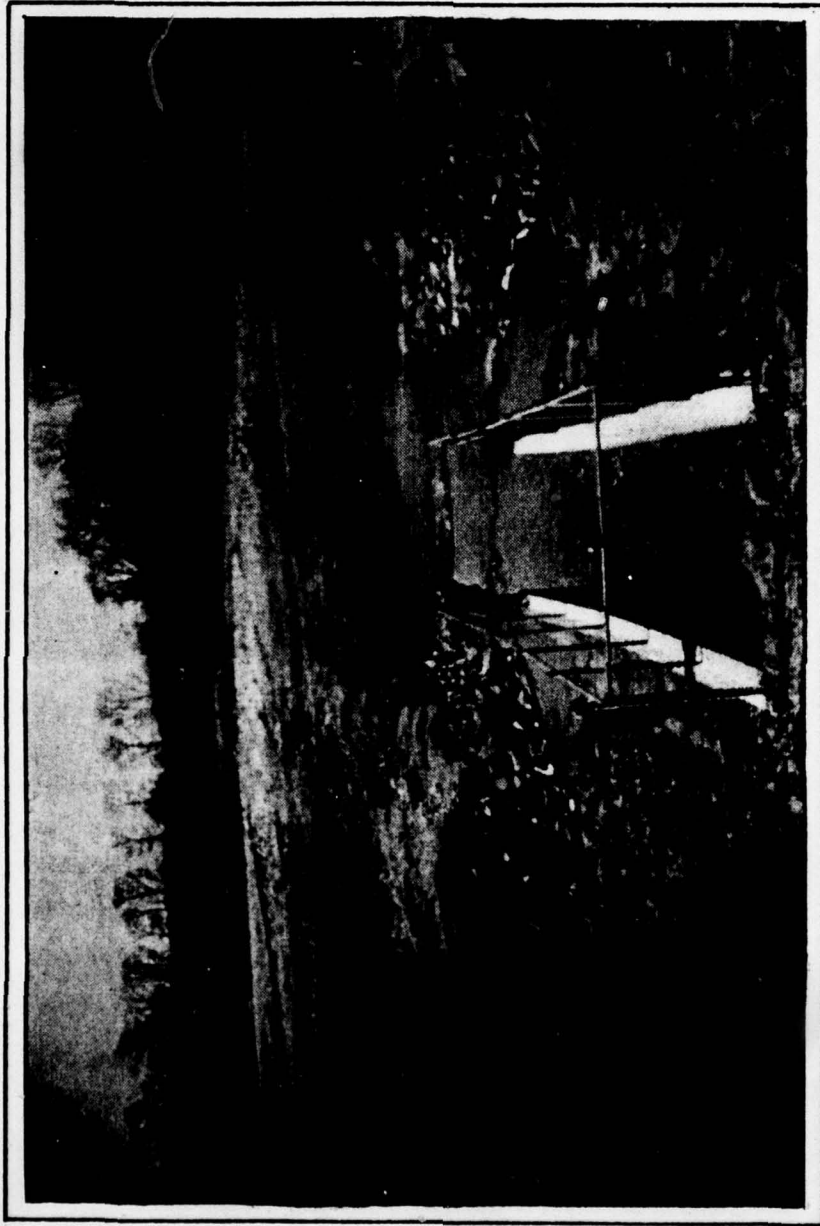
INTAKE RISER AND POND DRAIN VALVE.

PHOTOGRAPH NO. 1



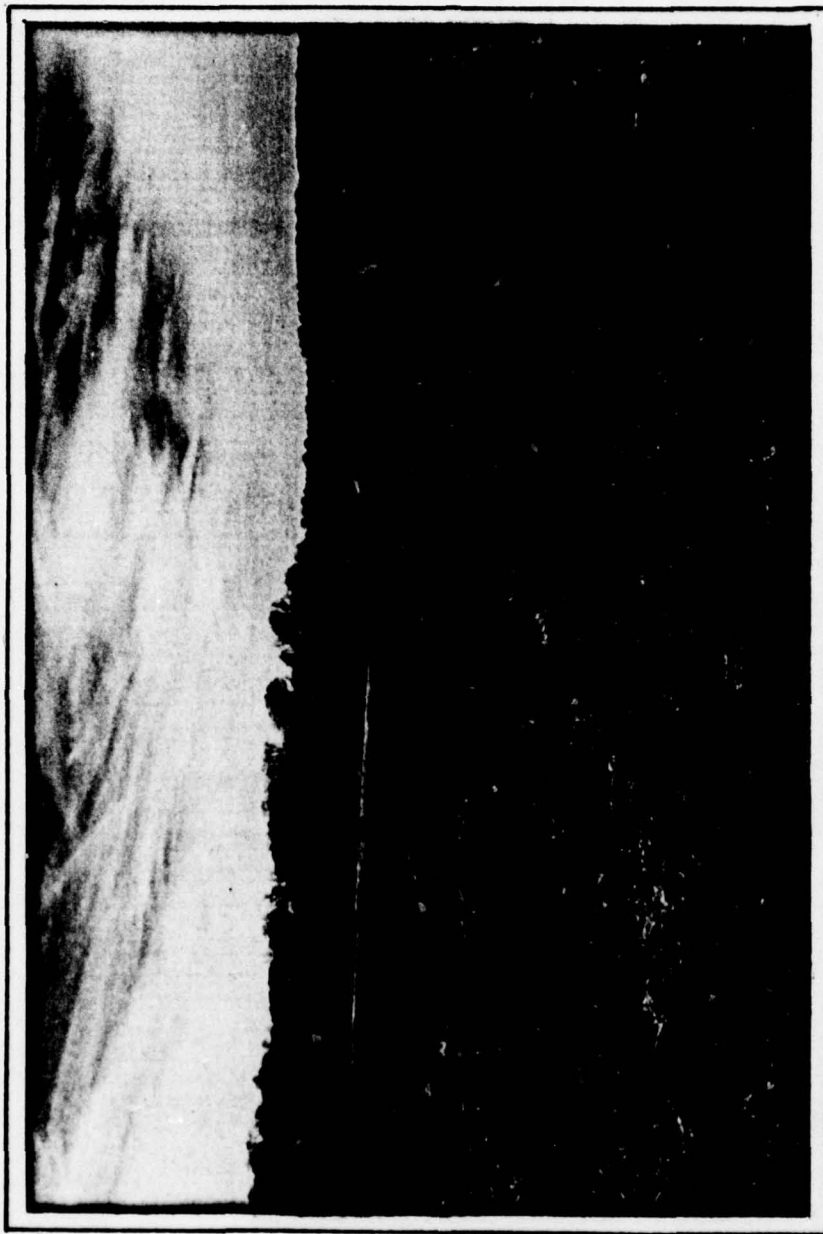
VIEW OF INTAKE RISER OVERFLOW WEIR.

PHOTOGRAPH NO. 2



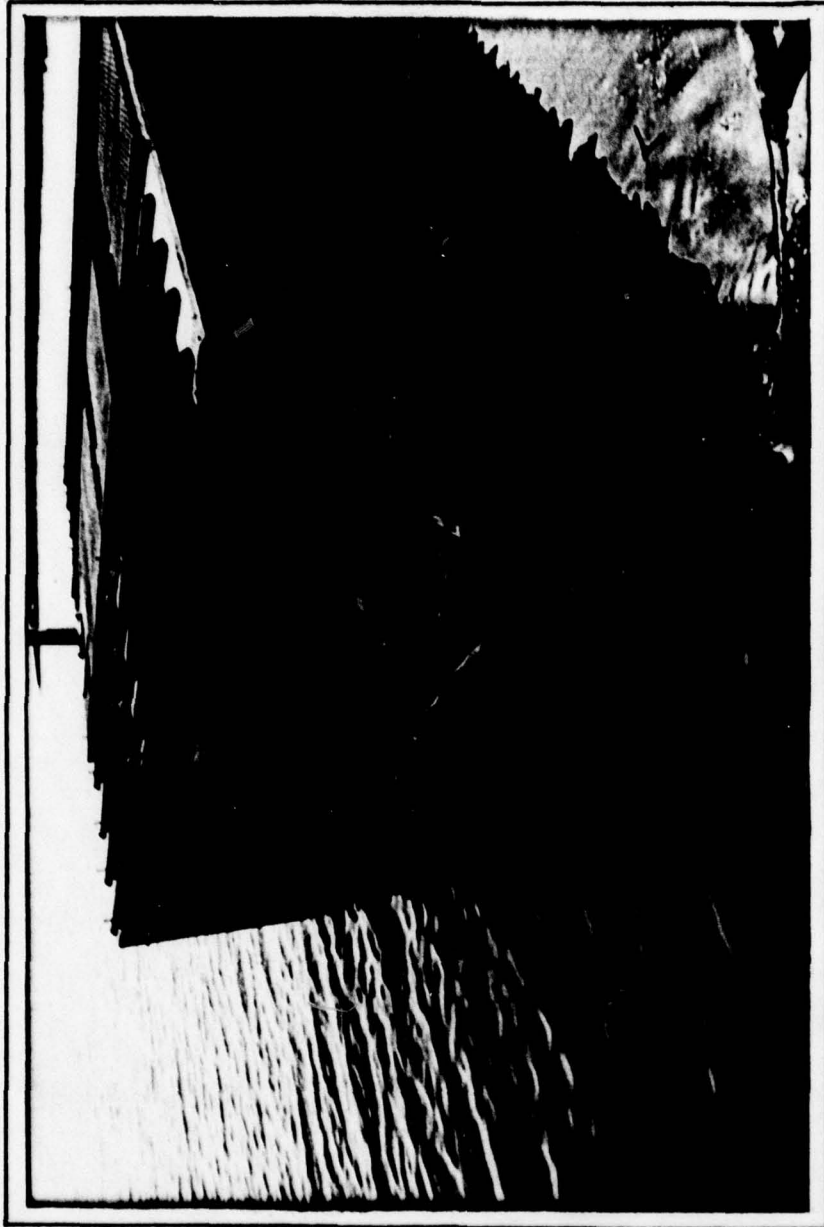
OVERVIEW OF SAF STRUCTURE AND
DISCHARGE CHANNEL. NOTE SCOUR
AND EROSION.

PHOTOGRAPH NO. 4



OVERVIEW OF GRASS LINED EMERGENCY
SPILLWAY.

PHOTOGRAPH NO. 5



DEBRIS COLLECTION AGAINST TRASH RACKS
OF PRINCIPAL SPILLWAY.

PHOTOGRAPH NO. 6



SLOPE SLOUGHING AND SHORELINE EROSION
ALONG UPSTREAM SLOPE OF DAM AT
WATERLINE.

PHOTOGRAPH NO. 7



OVERVIEW OF SHORELINE DETERIORATION
DUE TO ABSENCE OF RIPRAP PROTECTION.

PHOTOGRAPH NO. 8



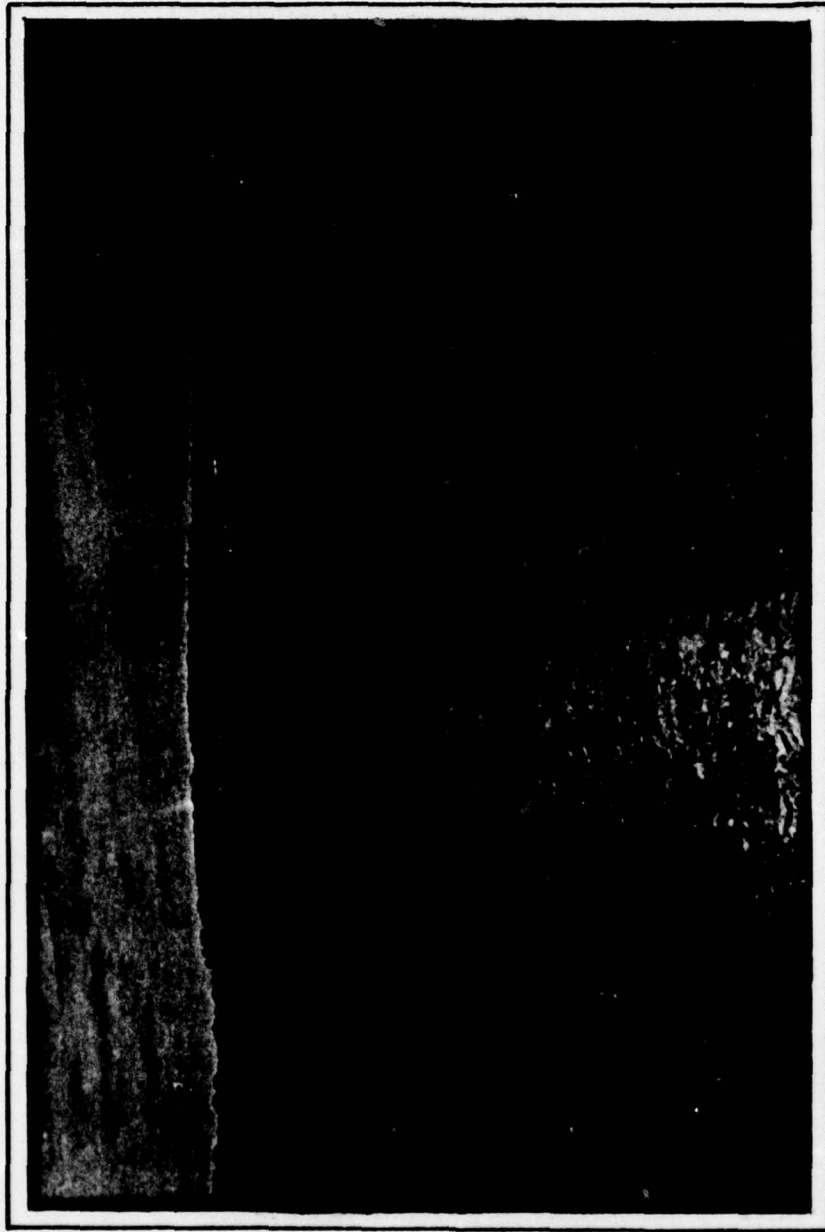
OVERVIEW OF EROSION AND SCOUR ALONG
PRINCIPAL SPILLWAY DISCHARGE CHANNEL.

PHOTOGRAPH NO. 9



OVERVIEW OF EMBANKMENT CREST DETERIORATION
DUE TO VEHICULAR TRAFFIC.

PHOTOGRAPH NO. 10



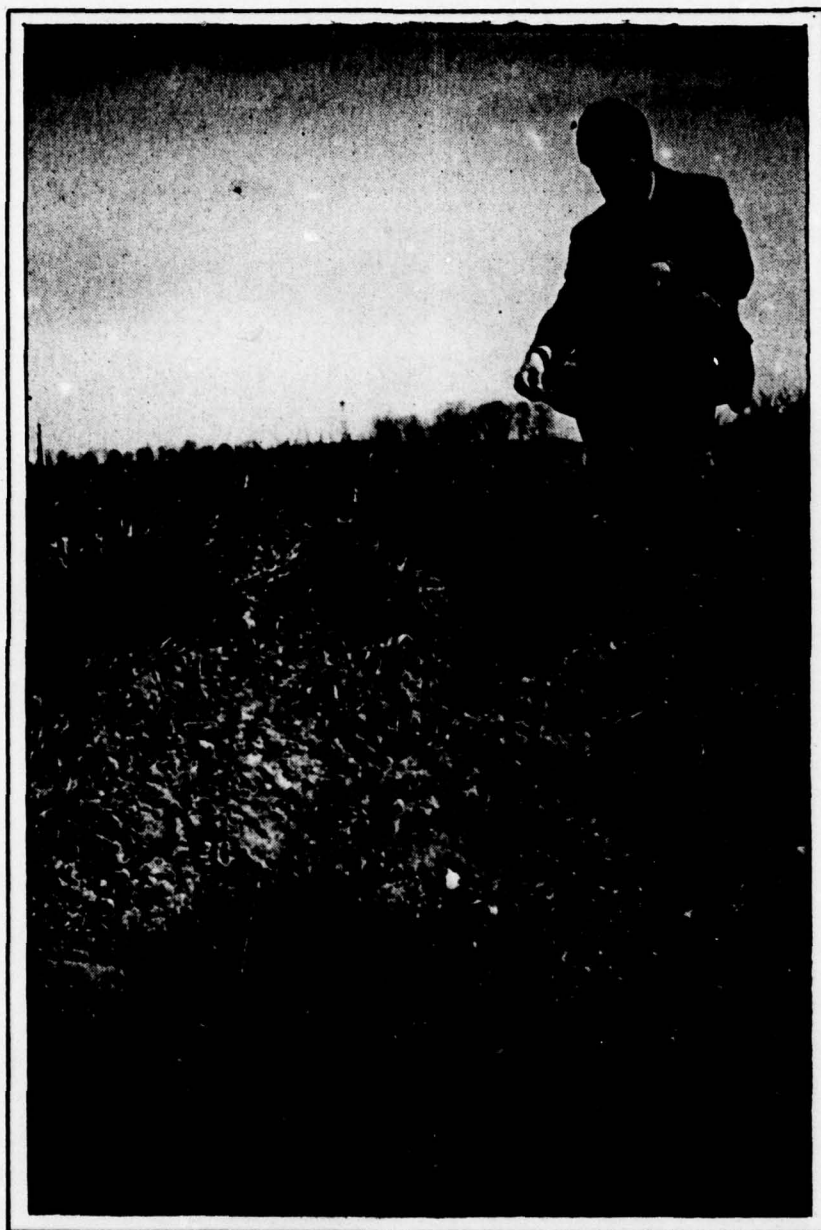
ALTERNATE VIEW OF CREST DETERIORATION.

PHOTOGRAPH NO. 11



UPSTREAM EMBANKMENT SLOPE
EROSION AND LACK OF
VEGETATION.

PHOTOGRAPH NO. 12



ALTERNATE VIEW OF GENERAL SLOPE
EROSION IN VICINITY OF PRINCIPAL
SPILLWAY OUTLET STRUCTURE.

PHOTOGRAPH NO. 13



GENERAL MUDDY AND MARSHY CONDITIONS
AT DOWNSTREAM TOE DUE TO STANDING
WATER AS A RESULT OF POOR SURFACE
DRAINAGE.

PHOTOGRAPH NO. 14



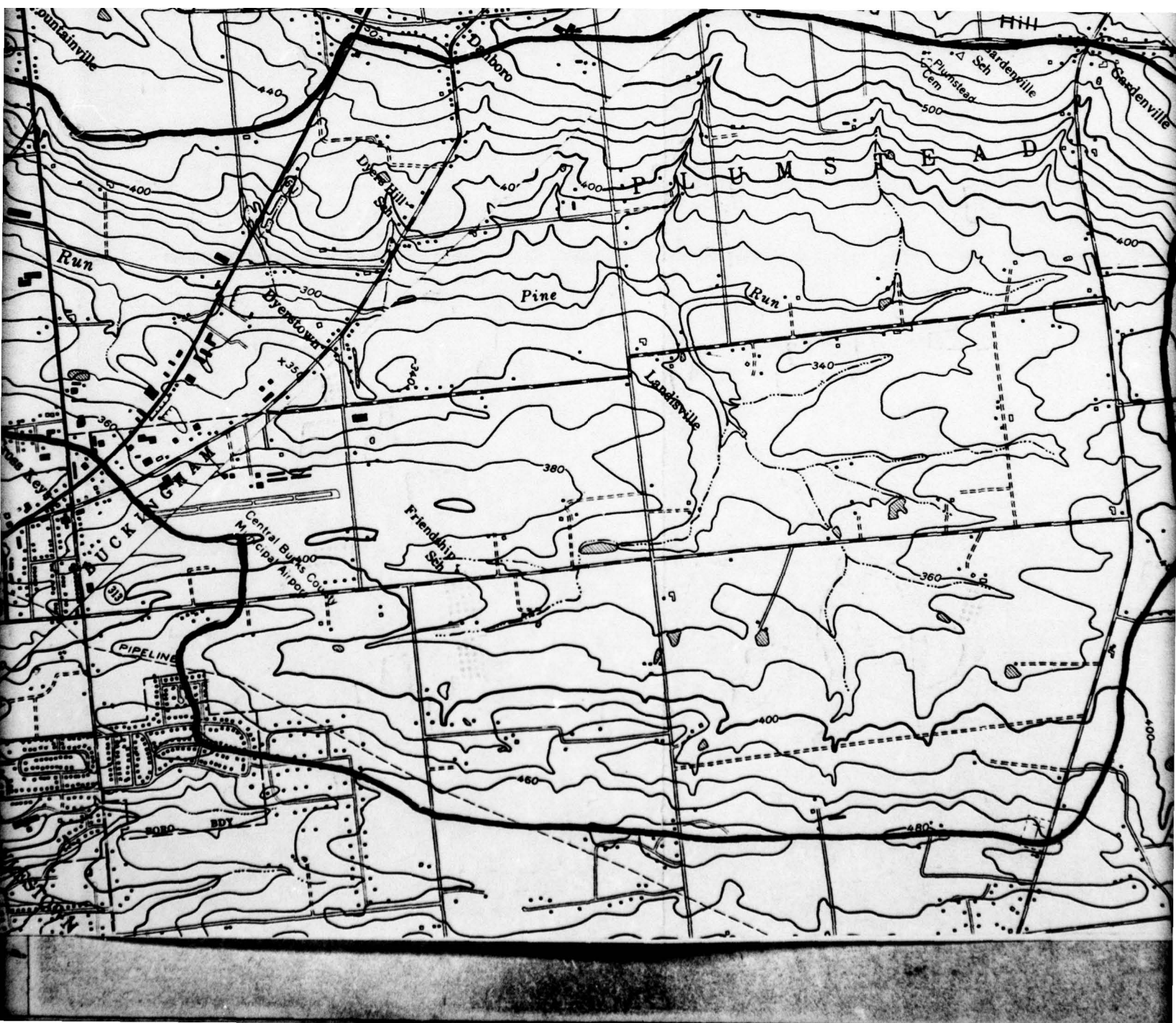
SLOPE EROSION AS A RESULT OF
UNAUTHORIZED VEHICULAR TRAFFIC.

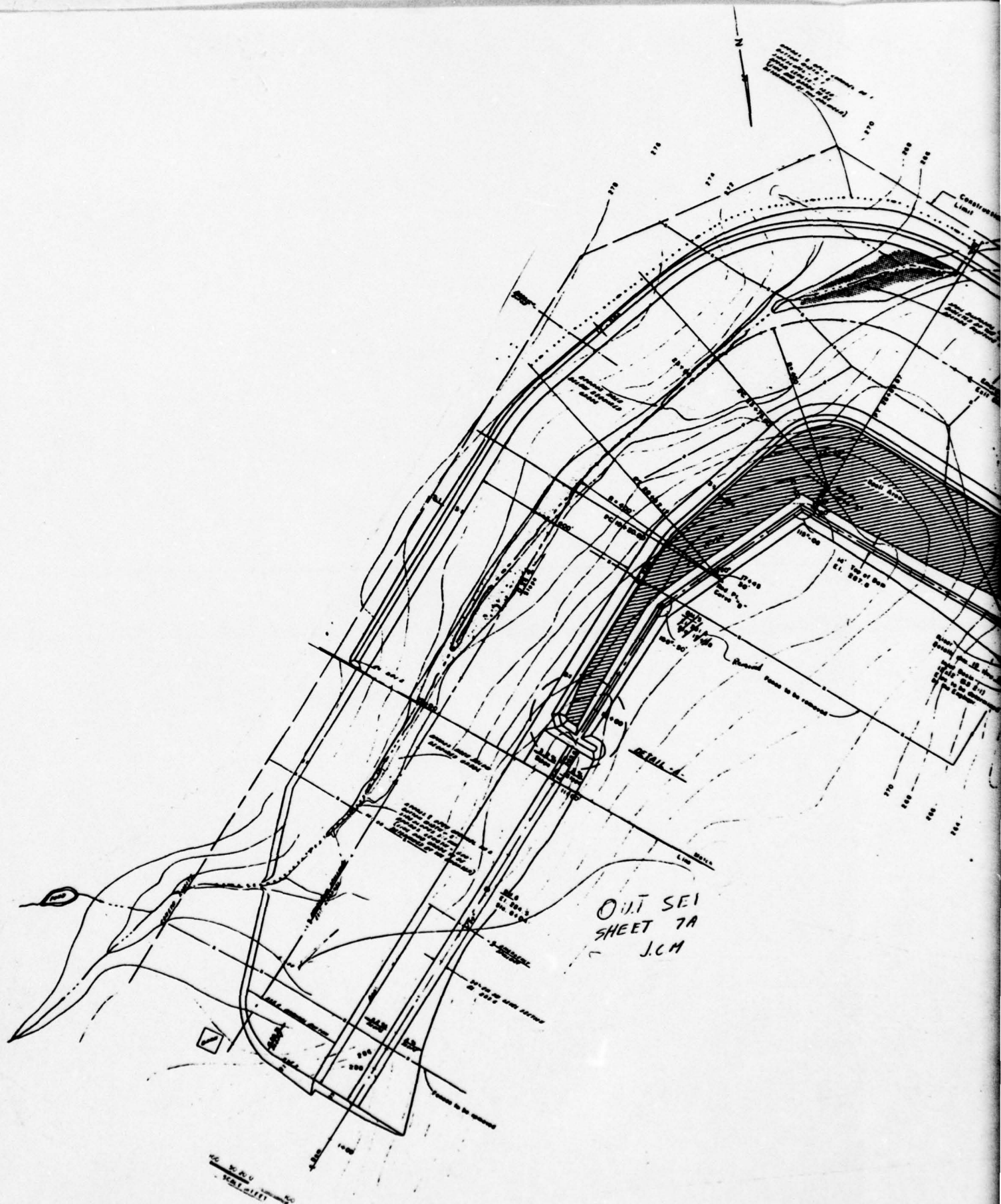
PHOTOGRAPH NO. 15

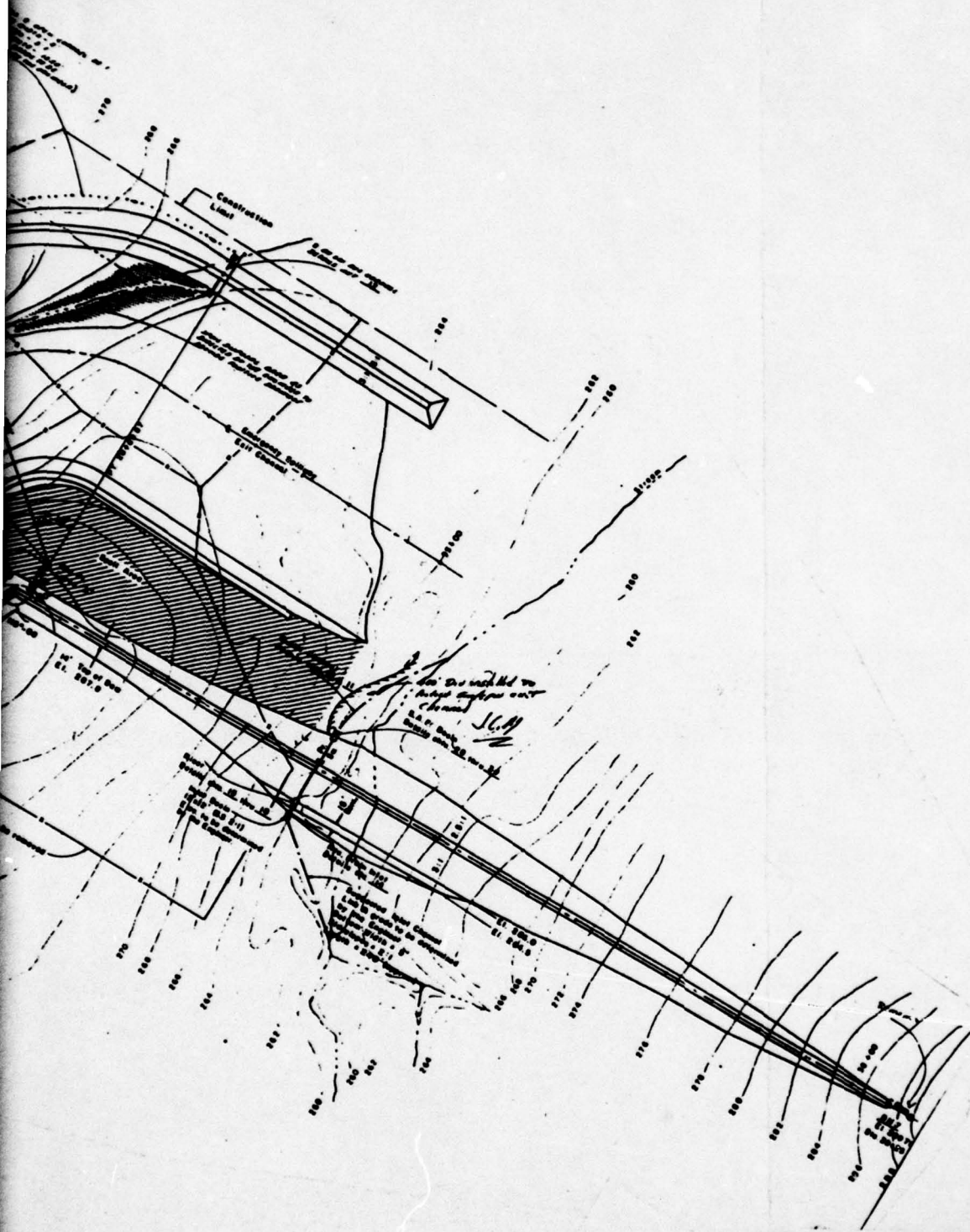
APPENDIX

E









AS BUILT PLANS

1" = 50' HORIZONTAL
1" = 10' VERTICAL
SCALE

PLAN OF DAM AND APPURTENANT STRUCTURES

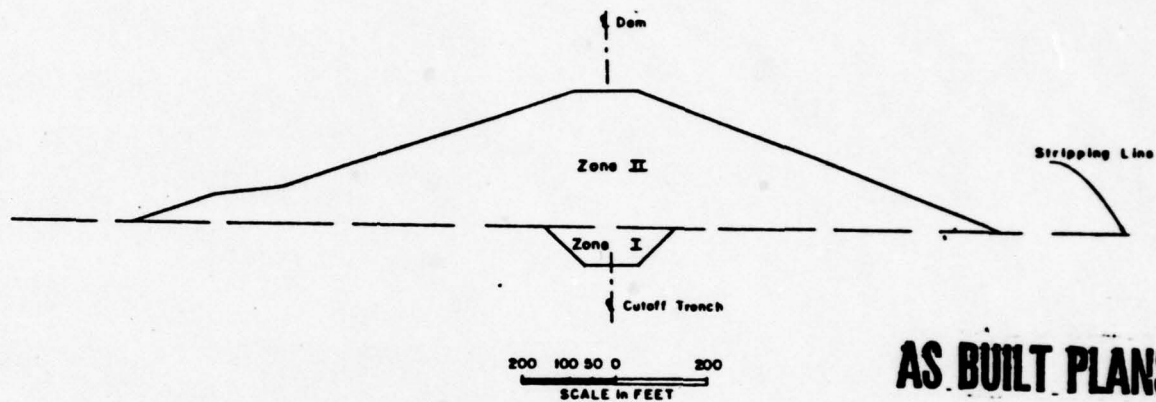
PINE RUN DAM

NAT.I.D.NO.PA.0080

BUCKS COUNTY

DATA OBTAINED FROM U.S. DEPT. OF AGRICULTURE, SOIL
CONSERVATION SERVICE, DRAWING NO. PA-618-P, SHEET
NOS. 6 & 7 OF 44, DATED 7/71

PLATE 2



AS BUILT PLANS

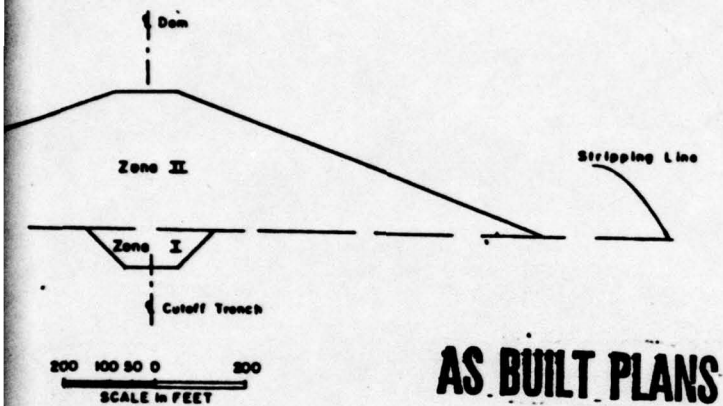
SELECTIVE PLACEMENT	MATERIAL	MAX ROCK SIZE	2. MAX. LIFT	REQ'D WATER CONTENT	COMPACTION	
					CLASS	DEFINITION
ZONE I	MATERIAL AS REPRESENTED BY TP-117.1, DEPTH 1' - 2.7', CLASSIFIED AS ML.	6"	9"	OPTIMUM TO -1 TO +2	A	95% MAX. DENSITY BY ASTM D-698, METHOD "A"
ZONE II	MATERIAL AS REPRESENTED BY TP-116.1, DEPTH 3' - 4', CLASSIFIED AS ML., BY TP-116.4 DEPTH 1' - 3', CLASSIFIED AS ML, BY TP-116.2, DEPTH 5' - 8' 5', CLASSIFIED AS WEATHERED SHALE.	6"	9"	OPTIMUM TO -1 TO +2	A	95% MAX. DENSITY BY ASTM D-698 METHOD "A"

CONSTRUCTION NOTES

1. CONSTRUCTED SLOPES ARE
2.95 : 1 UPSTREAM
2.46 : 1 DOWNSTREAM
2. FOR CONSTRUCTED FILL ELEVATION
SEE SMT, 8.

1. FOR FILL ADJACENT TO STRUCTURES, MAX. ROCK SIZE 3".
2. MAXIMUM PERMISSIBLE LIFT THICKNESS BEFORE COMPACTION.
3. WATER CONTENT OF FILL MATRIX AT TIME OF COMPACTION. Variation from water content shown may be approved by the Engineer.
4. FOR TYPICAL COMPACTION CURVES SEE SMT, 40.

FILL PLACEMENT



AS BUILT PLANS

REQ'D WATER CONTENT	COMPACTION	
	CLASS	DEFINITION
OPTIMUM TO -1 TO +2	A	95% MAX. DENSITY BY ASTM D-698, METHOD "A"
OPTIMUM TO -1 TO +2	A	95% MAX. DENSITY BY ASTM D-698 METHOD "A"

CONSTRUCTION NOTES

1. CONSTRUCTED SLOPES ARE
2.95 : 1 UPSTREAM
2.46 : 1 DOWNSTREAM
2. FOR CONSTRUCTED FILL ELEVATIONS
SEE SMT. A.

Water content shown may be approved by the Engineer.

PLACEMENT

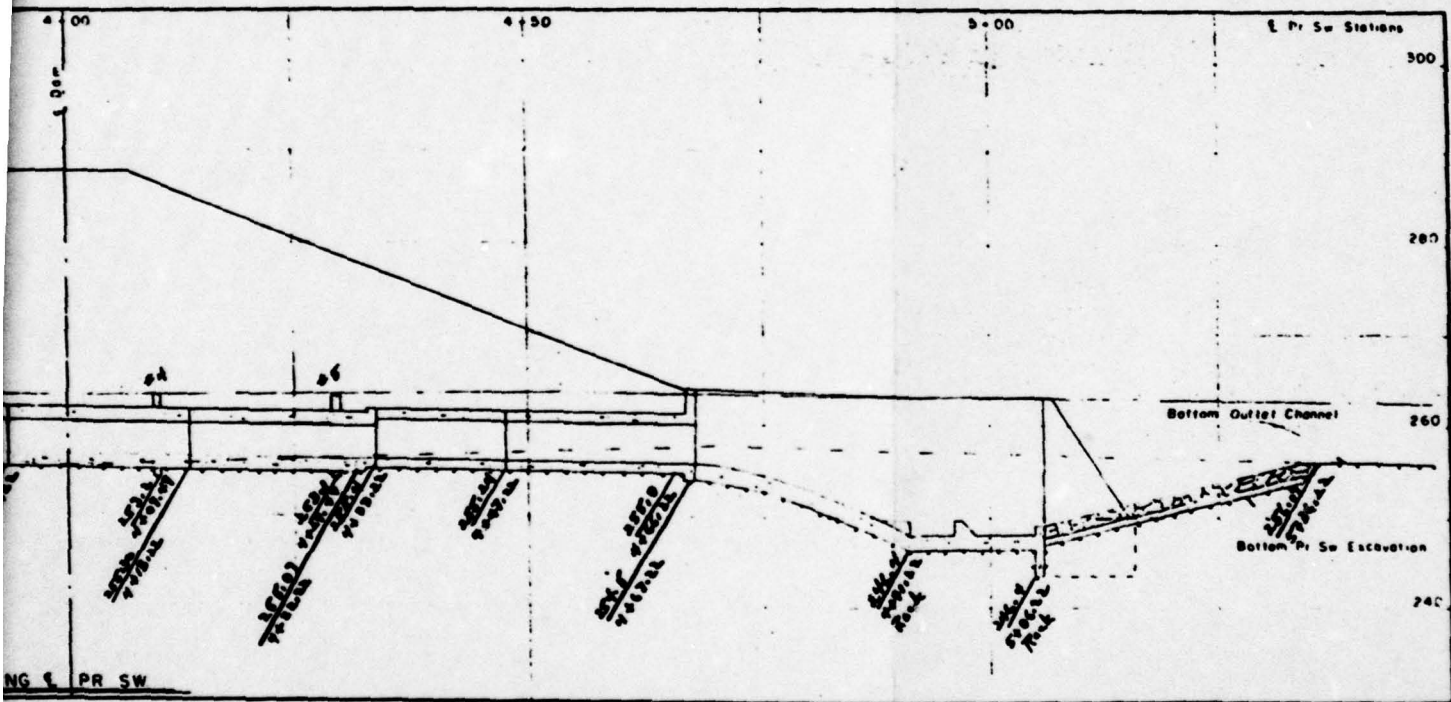
TYPICAL EMBANKMENT SECTION AND MATERIAL DESCRIPTION PINE RUN DAM

NAT.I.D.NO.PA.00805

BUCKS COUNTY

DATA OBTAINED FROM U.S. DEPT. OF AGRICULTURE, SOIL
CONSERVATION SERVICE, DRAWING NO. PA-616-P
SHEET NO. 7 OF 44, DATED 7/71

PLATE 3



Exc. Anti-Sep Collar Base Rk. 4 page 22
 Exc. Conduit " " page 23, 24, 25

PLANS

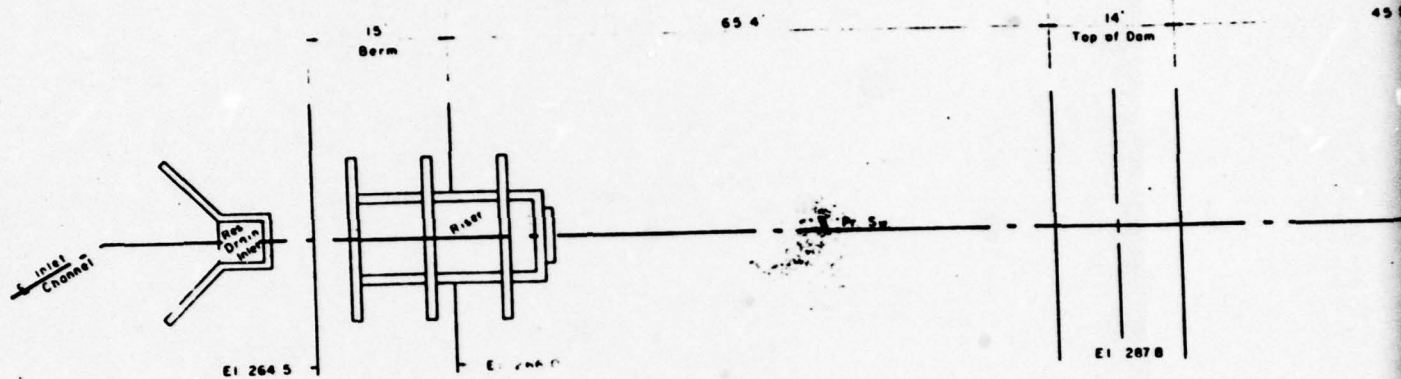
PRINCIPAL SPILLWAY EXCAVATION SECTION
PINE RUN DAM

NAT.I.D.NO.PA.00808

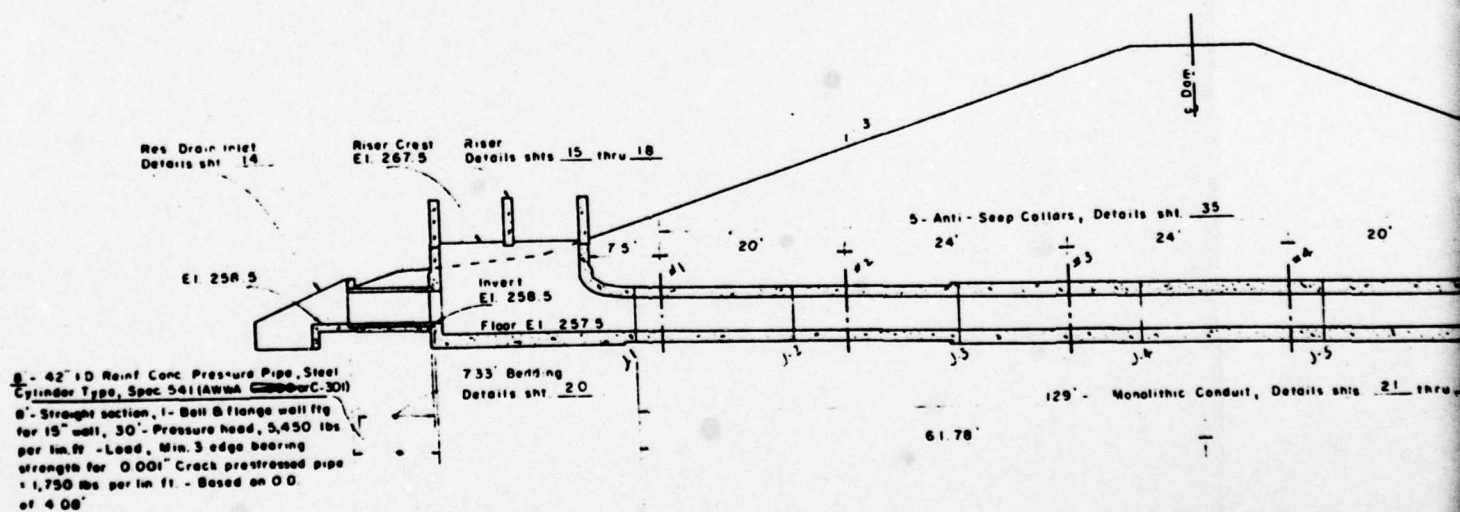
BUCKS COUNTY

DATA OBTAINED FROM U.S. DEPT. OF AGRICULTURE, SOIL
 CONSERVATION SERVICE, DRAWING NO. PA-816-P
 SHEET NO. 11 OF 44, DATED 4/71

PLATE 4

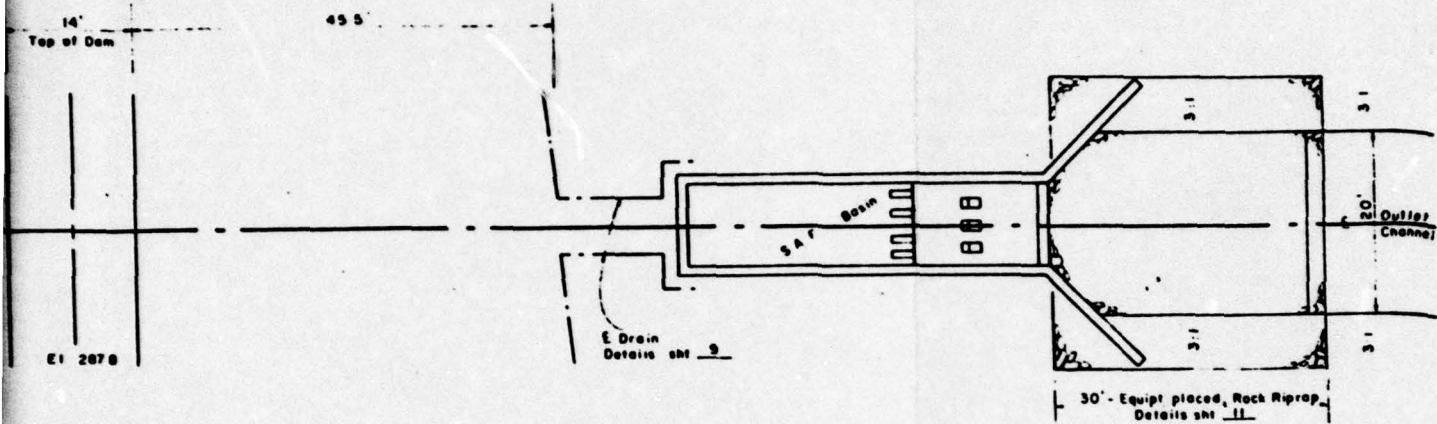


PLAN VIEW



PROFILE ALONG E

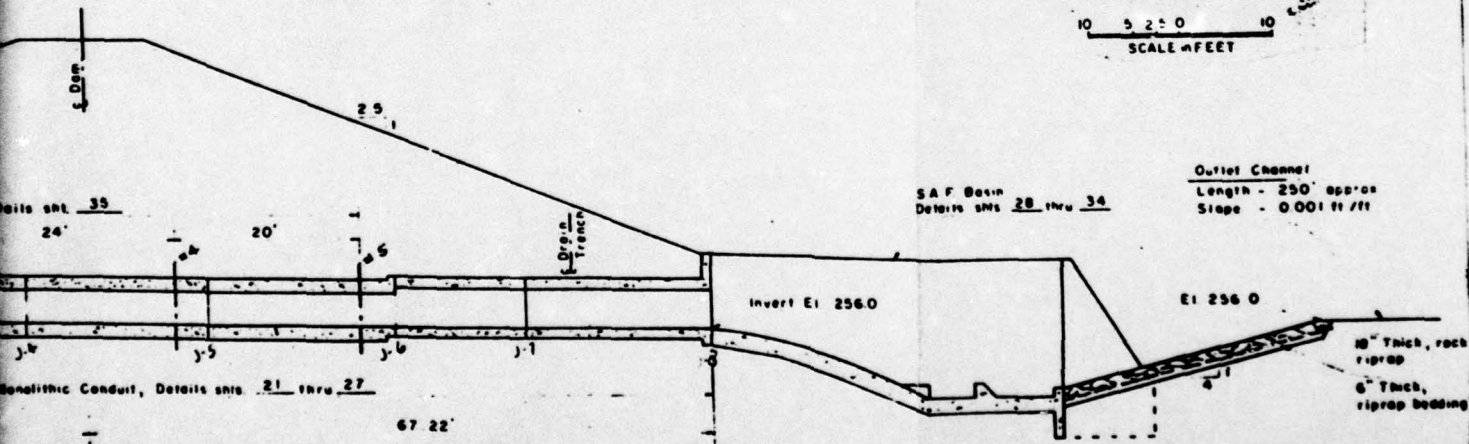
8 - 42" ID Reinf. Conc. Pressure Pipe, Steel Cylinder Type, Spec 541 (AWWA C-301)
 8" - Straight section, 1- Bolt & Flange wall fit for 15" wall, 30" - Pressure head, 5,450 lbs per lin. ft. - Load, Min. 3 edge bearing strength for 0.001" Crack prestressed pipe = 1,750 lbs per lin. ft. - Based on O.D. of 4.06'



PLAN VIEW

AS BUILT PLANS

10 5 2 0 10
SCALE in FEET



PROFILE ALONG E

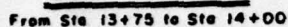
PRINCIPAL SPILLWAY PLAN AND PROFILE PINE RUN DAM

NAT.I.D.NO.PA.00806

BUCKS COUNTY

DATA OBTAINED FROM U.S. DEPT. OF AGRICULTURE, SOIL
CONSERVATION SERVICE, DRAWING NO. PA-618-P
SHEET NO. 10 OF 44, DATED 4/71

PLATE 5



From Sta. 14+00 to Sta. 15+00

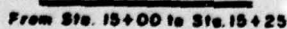
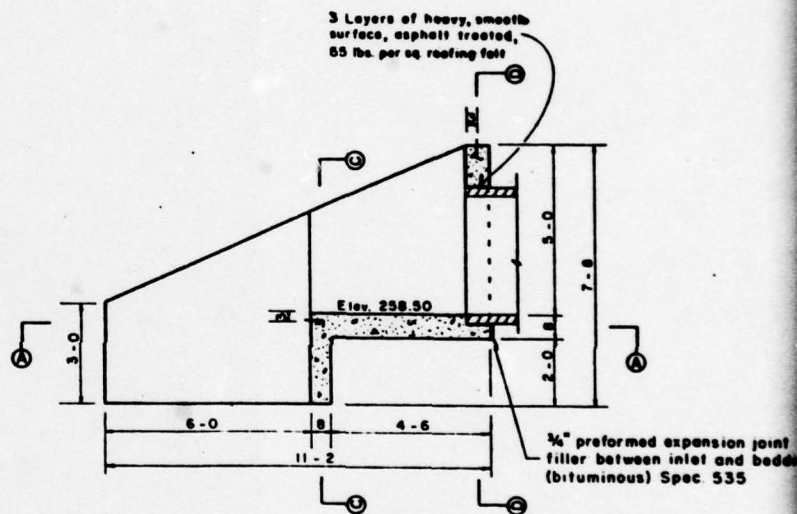
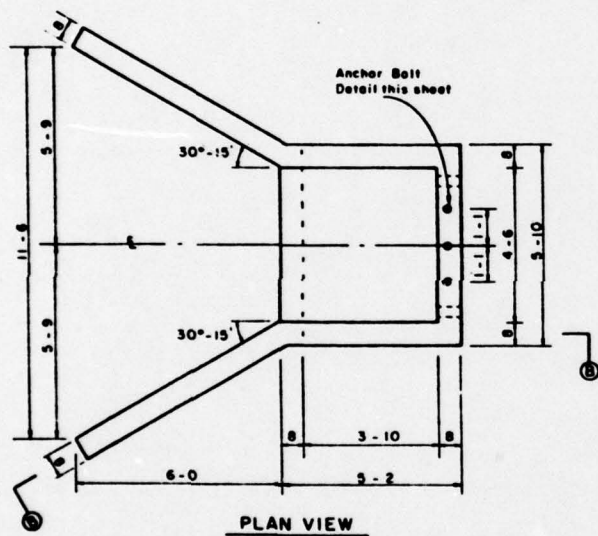


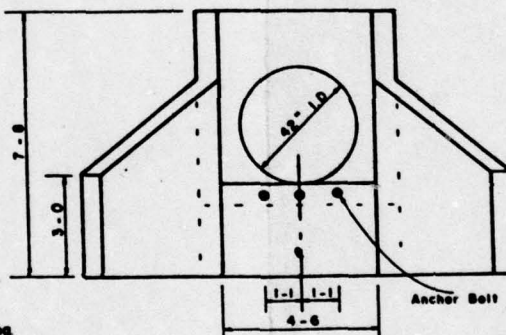
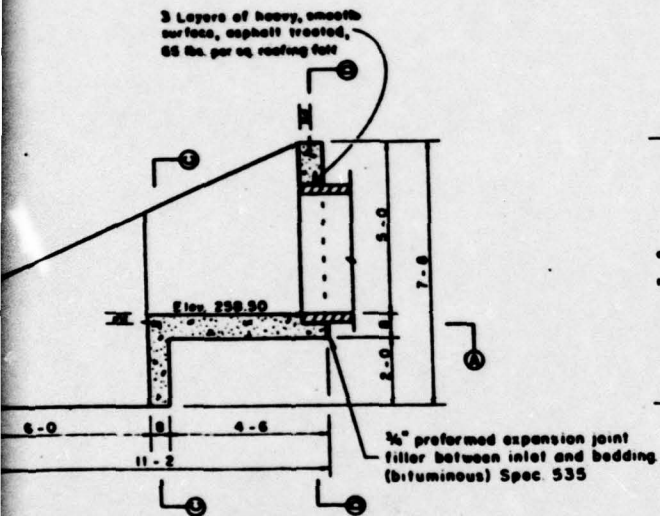
PLATE 61



AS BUILT PLANS

12 6 0 12 24 36
SCALE in INCHES

3 Layers of heavy, smooth
surface, asphalt treated,
65 lb. per sq. roofing felt



12 6 0 12 24 36
SCALE in INCHES

DETAILS OF INLET STRUCTURE

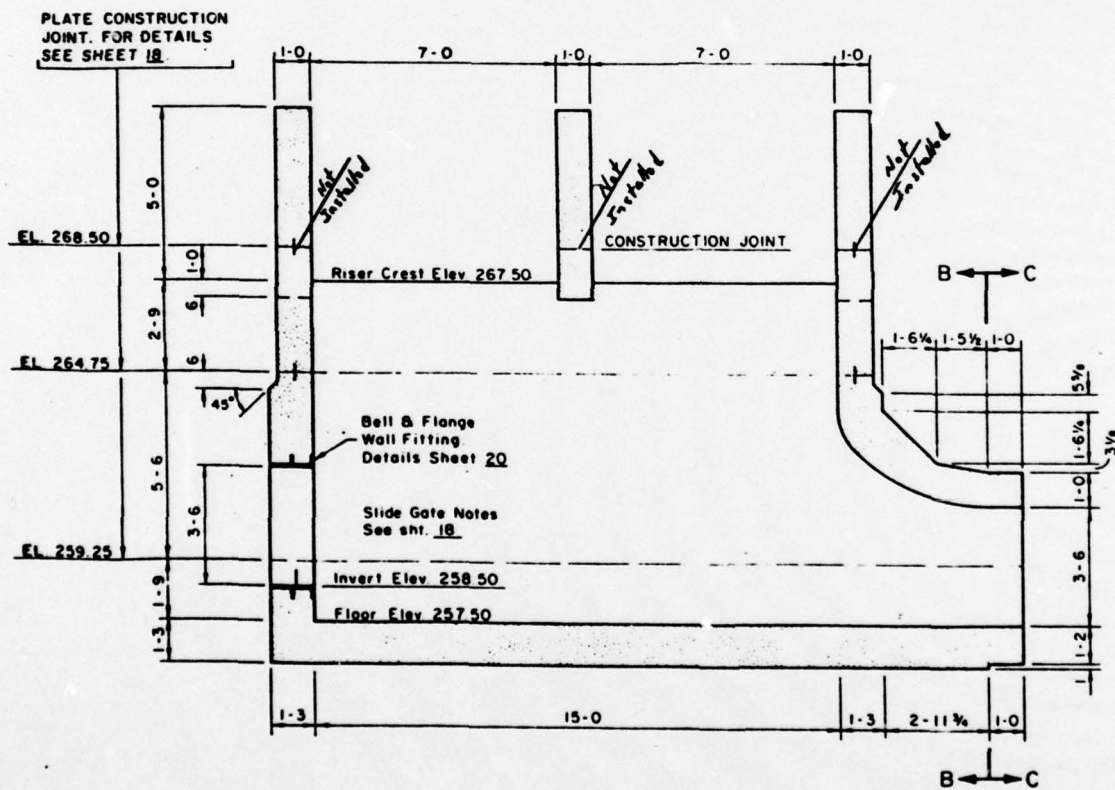
PINE RUN DAM

NAT.I.D.NO.PA.00205

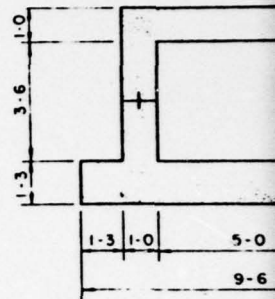
BUCKS COUNTY

DATA OBTAINED FROM U.S. DEPT. OF AGRICULTURE, SOIL
CONSERVATION SERVICE, DRAWING NO. PA-616-P
SHEET NO. 14 OF 44, DATED 2/71

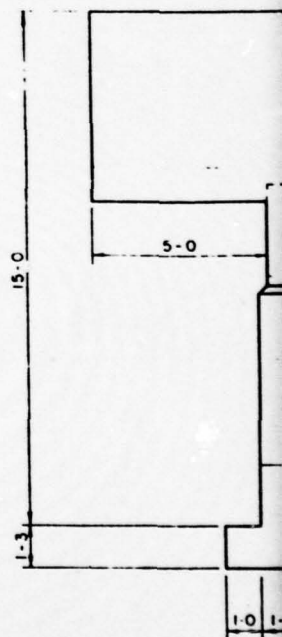
PLATE 7



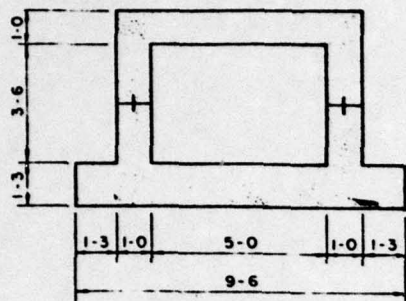
SECTION A-A



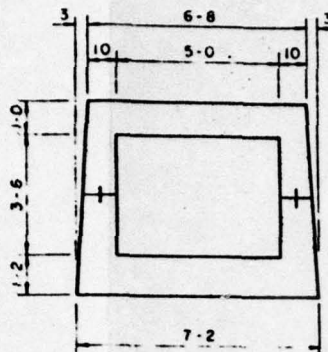
SECTION



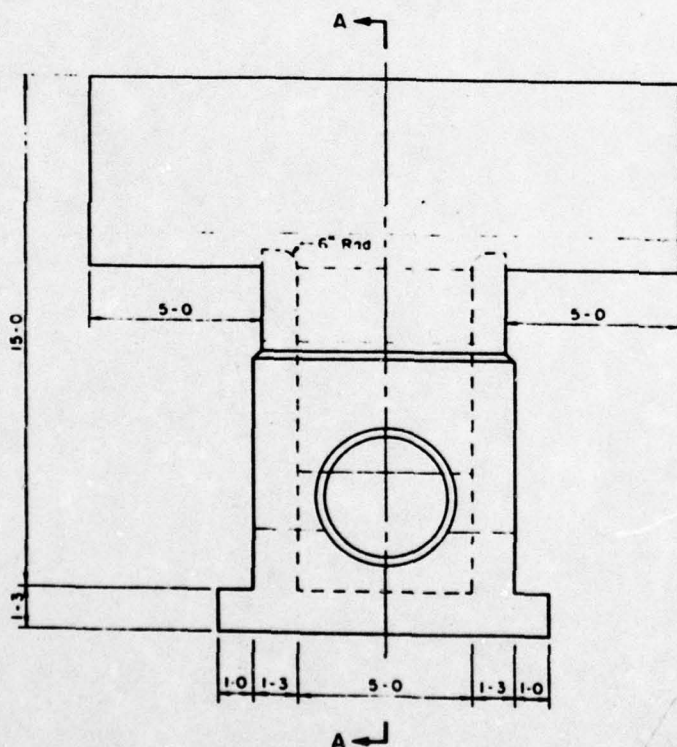
UPS



SECTION B-B

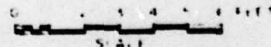


SECTION C-C



UPSTREAM ELEVATION

AS BUILT PLANS



RISER DETAILS

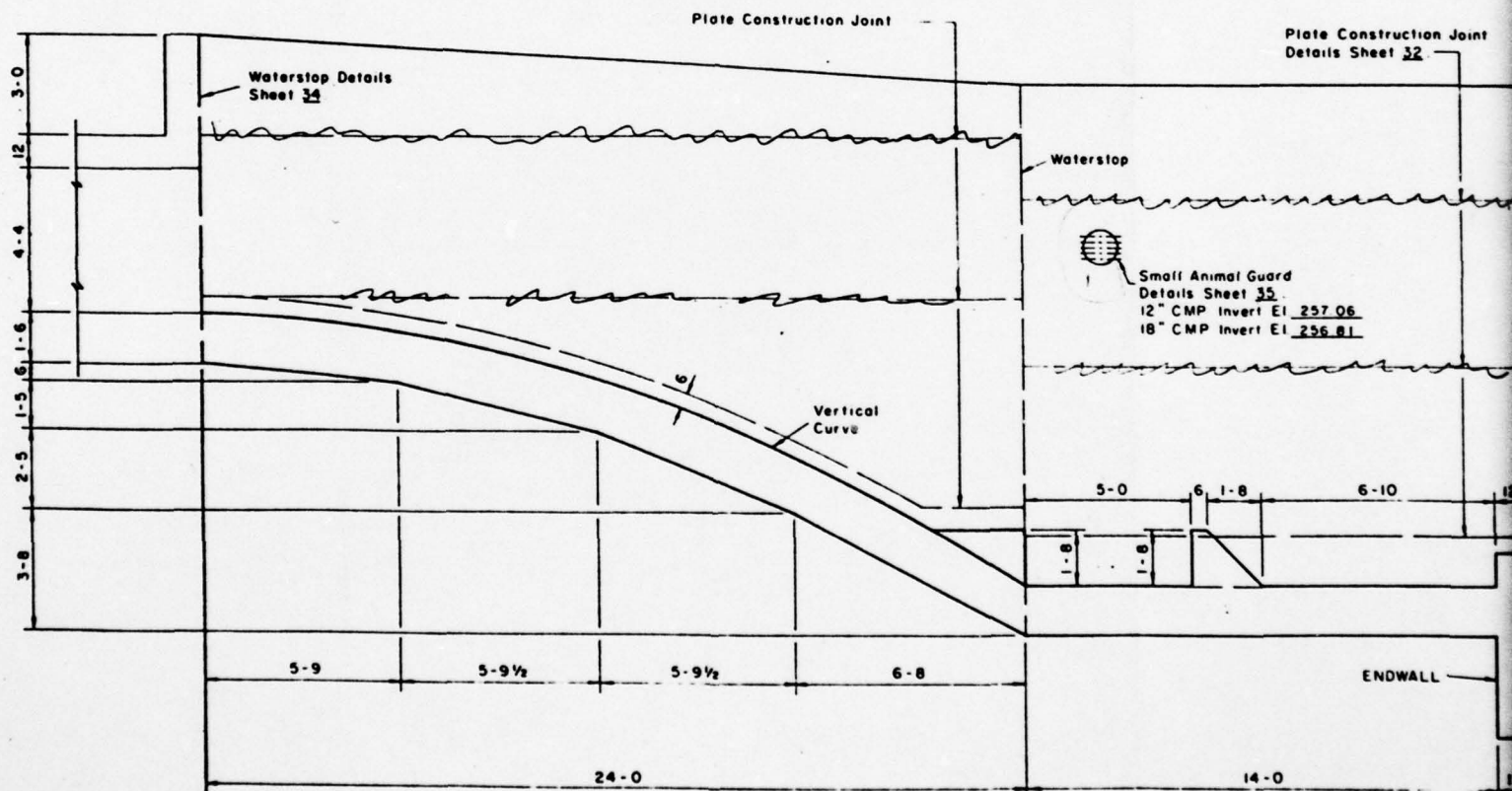
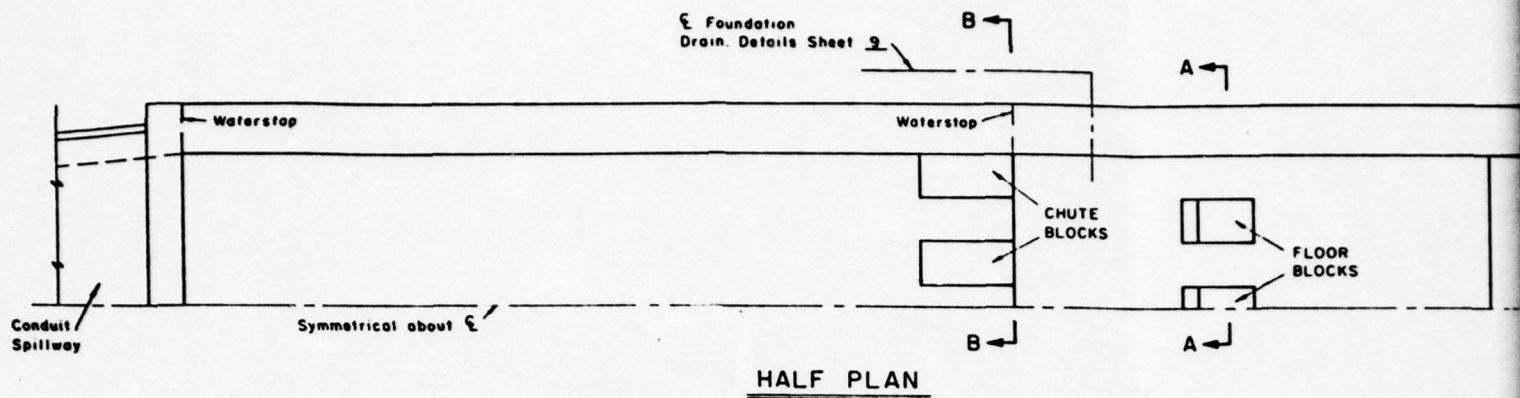
PINE RUN DAM

NAT.I.D.NO.PA.00806

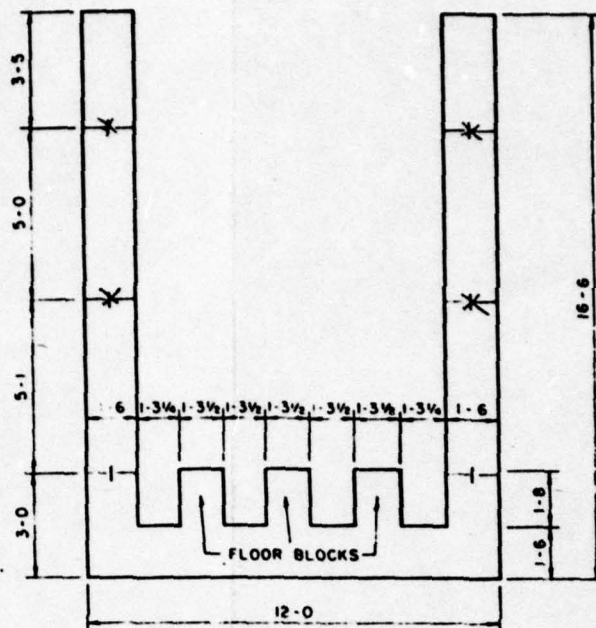
BUCKS COUNTY

DATA OBTAINED FROM U.S. DEPT. OF AGRICULTURE, SOIL
CONSERVATION SERVICE, DRAWING NO. PA-616-P
SHEET NO. 15 OF 44, DATED 10/70

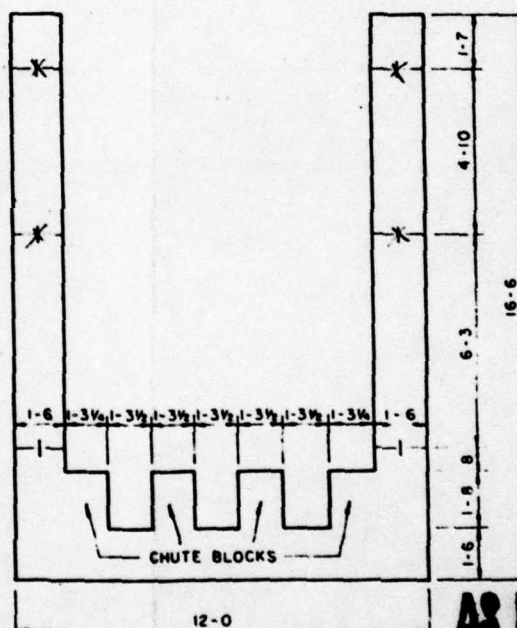
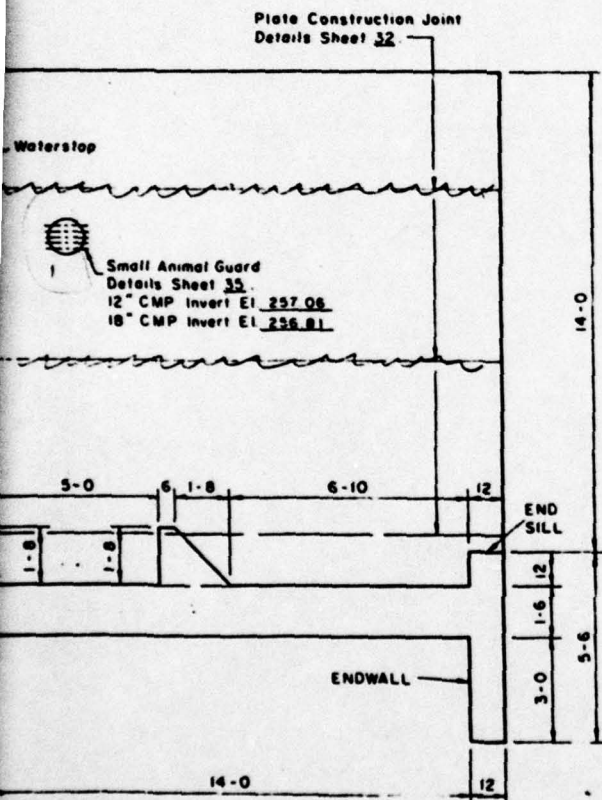
PLATE 8



SECTION ALONG CENTERLINE

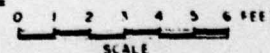


SECTION A-A



SECTION B-B

AS BUILT PLANS



PINE RUN DAM

NAT.I.D.NO.PA.0080

BUCKS COUNTY

DATA OBTAINED FROM U.S. DEPT. OF AGRICULTURE, SOIL
CONSERVATION SERVICE, DRAWING NO. PA-616-P
SHEET NO. 28 OF 44, DATED 10/71

PLATE 9

LEGEND

TEST HOLE NUMBERING SYSTEM

Centerline of Dam	1 - 99
Borrow area	101 - 199
Emergency spillway	201 - 299
Centerline of outlet structure	301 - 399
Stream channel	401 - 499
Relief wells	501 - 599
	601 - 699
	701 - 799

UNIFIED SOIL CLASSIFICATION SYSTEM SYMBOLS

GW	Well graded gravels, gravel-sand mixtures
GP	Poorly graded gravels
GM	Silty gravels, gravel-sand-silt mixtures
GC	Clayey gravels, gravel-sand-clay mixtures
SW	Well graded sands, sand-gravel mixtures
SP	Poorly graded sands
SM	Silty sands, sand-silt mixtures
SC	Clayey sands, sand-clay mixtures
ML	Silts, silty, very fine sands, sandy or clayey silts
CL	Clays of low to medium plasticity, silty, sandy or gravelly clays
CH	Clays of high plasticity, fat clays
MH	Elastic silts, micaceous or diatomaceous silts
OL	Organic silts and organic silty clays of low plasticity
OH	Organic clays or silts of medium to high plasticity

BEDROCK SYMBOLS

B	Basalt	Sc	Schist
Gn	Gneiss	Sh	Shale
Gr	Granite	Sis	Siltstone
Ls	Limestone	Sl	Slate
Ma	Marble	Ss	Sandstone

SAMPLES

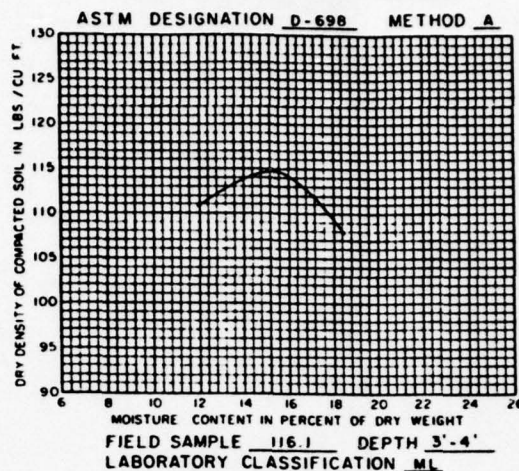
DS	Disturbed
US	Undisturbed

NOTE

All soil and rock classifications were determined by visual examination unless otherwise noted.

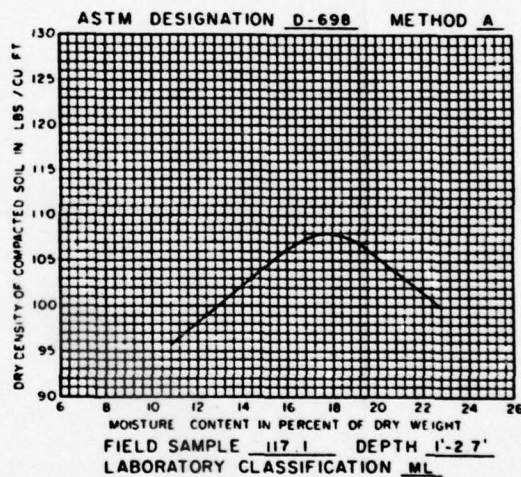
COMPACTION CURVE

LABORATORY SAMPLE NO 70W678



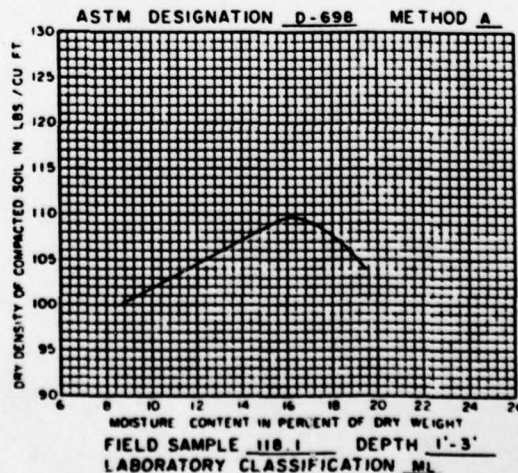
COMPACTION CURVE

LABORATORY SAMPLE NO 70W679



COMPACTION CURVE

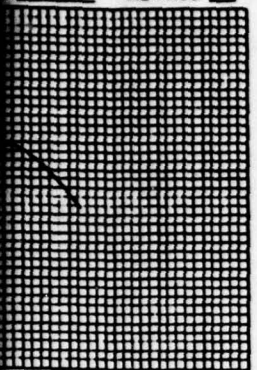
LABORATORY SAMPLE NO 70W680



COMPACTION CURVE

SAMPLE NO 70W678

ASTM DESIGNATION D-698 METHOD A

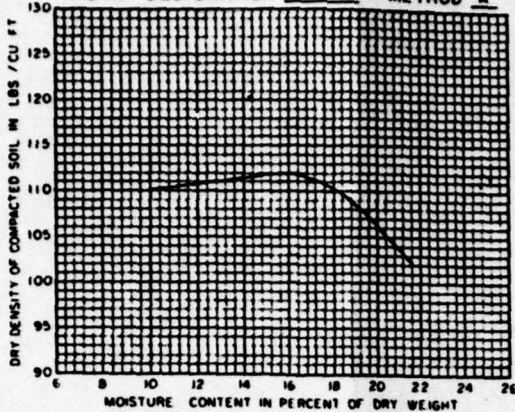


FIELD SAMPLE 116.1 DEPTH 3'-4'
LABORATORY CLASSIFICATION ML

COMPACTION CURVE

LABORATORY SAMPLE NO 70W681

ASTM DESIGNATION D-698 METHOD A

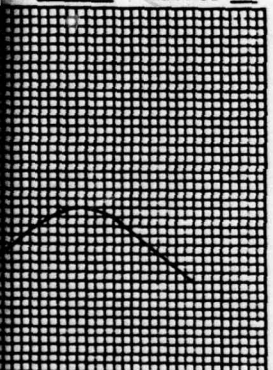


FIELD SAMPLE 118.2 DEPTH 5'-9.5'
LABORATORY CLASSIFICATION None

COMPACTION CURVE

SAMPLE NO 70W679

ASTM DESIGNATION D-698 METHOD A

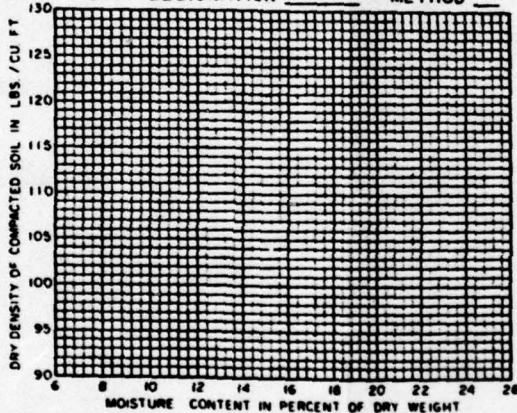


FIELD SAMPLE 117.1 DEPTH 1'-2.7'
LABORATORY CLASSIFICATION ML

COMPACTION CURVE

LABORATORY SAMPLE NO _____

ASTM DESIGNATION _____ METHOD _____

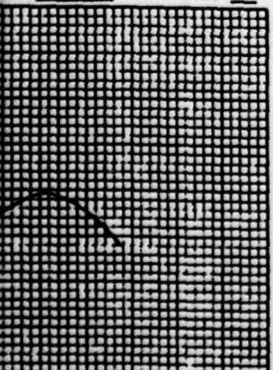


FIELD SAMPLE _____ DEPTH _____
LABORATORY CLASSIFICATION _____

COMPACTION CURVE

SAMPLE NO 70W680

ASTM DESIGNATION D-698 METHOD A



FIELD SAMPLE 118.1 DEPTH 1'-3'
LABORATORY CLASSIFICATION ML

TYPICAL EMBANKMENT SOIL COMPACTION DATA

PINE RUN DAM

NAT.I.D.NO.PA.00808

BUCKS COUNTY

DATA OBTAINED FROM U.S. DEPT. OF AGRICULTURE, SOIL
CONSERVATION SERVICE, DRAWING NO. PA-816-P
SHEET NO. 40 OF 44, DATED 4/71

PLATE 10

APPENDIX

F

SITE GEOLOGY
PINE RUN DAM

Pine Run Dam is located in the Triassic Lowland Section of the Piedmont Physiographic Province. As shown on Plate F-1, the bedrock upon which the dam is constructed consists of interbedded shale and sandstone of the Stockton Formation of Triassic Age. Downstream from the dam along the banks of Pine Run are exposures of decomposed siltstone. The bedding strikes east-northeast (near-perpendicular to the dam axis) and dips 15 degrees to the north-northwest. High angle rock jointing was also observed to strike to the east-northeast and northwest. The orientation of rock jointing and the variable degree of rock weathering relative to rock type are conditions favorable to downstream seepage.

